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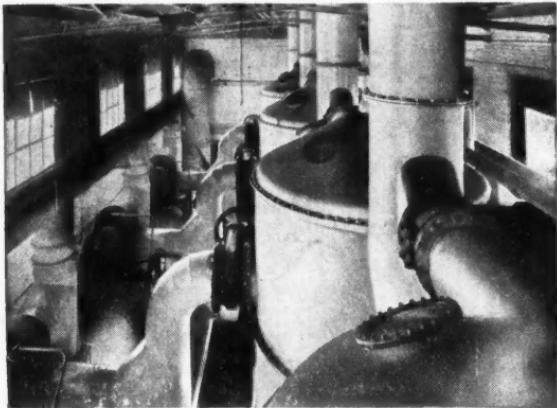
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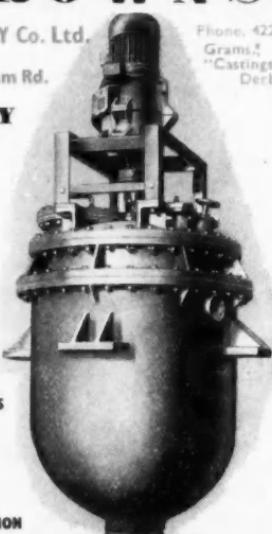
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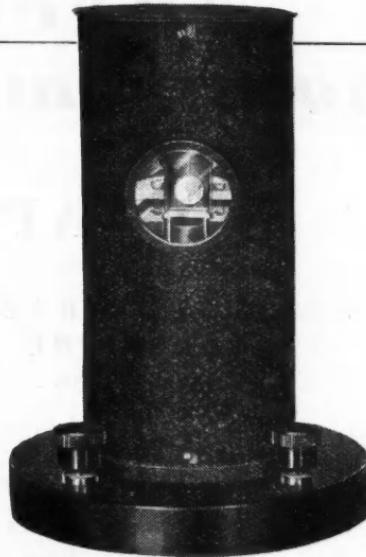
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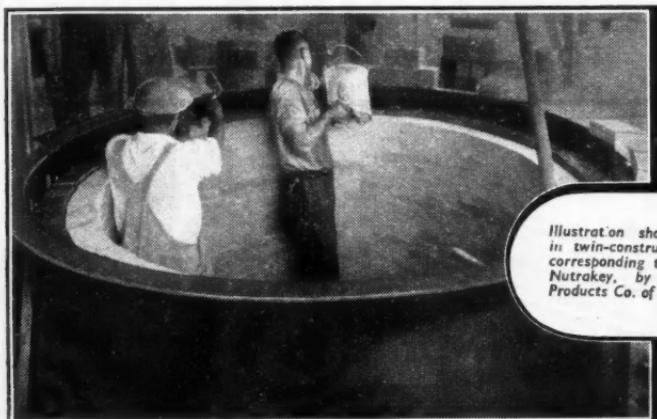


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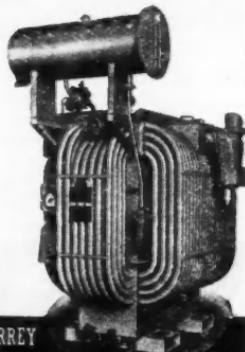


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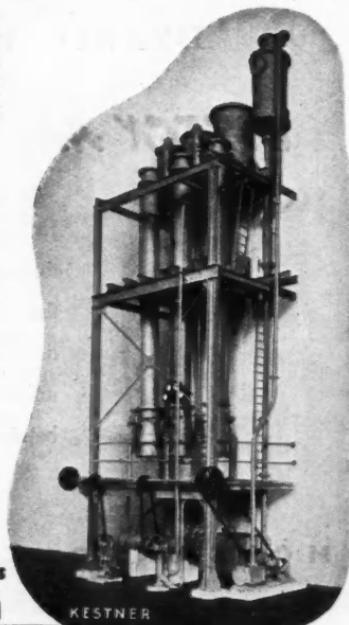
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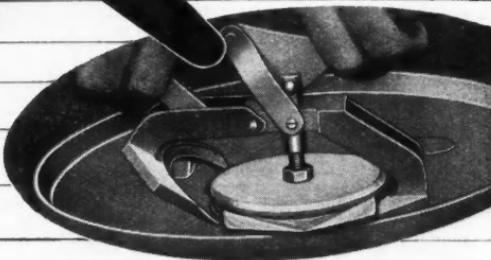
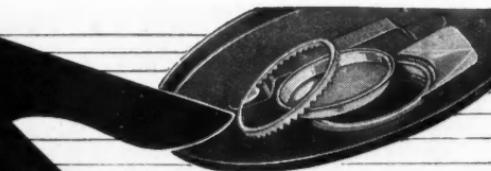


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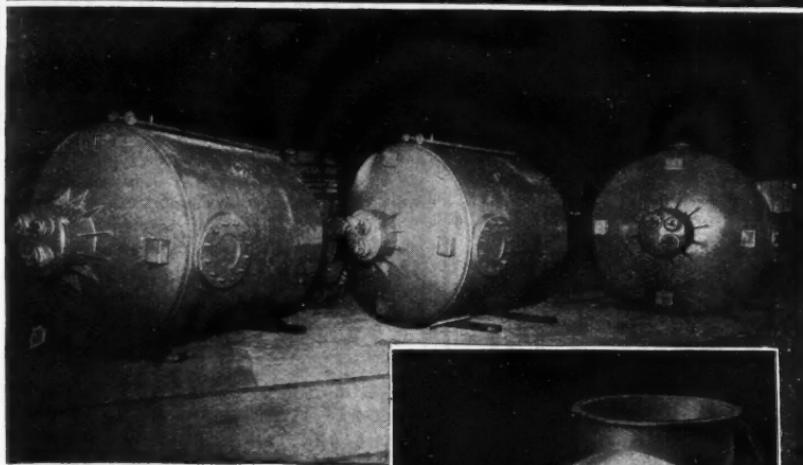


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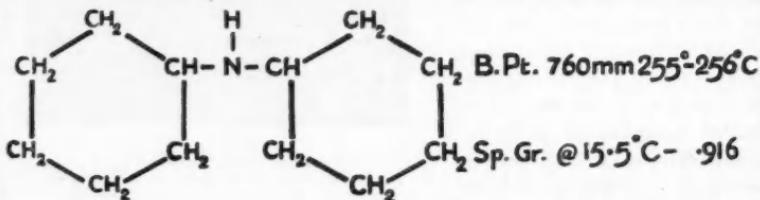
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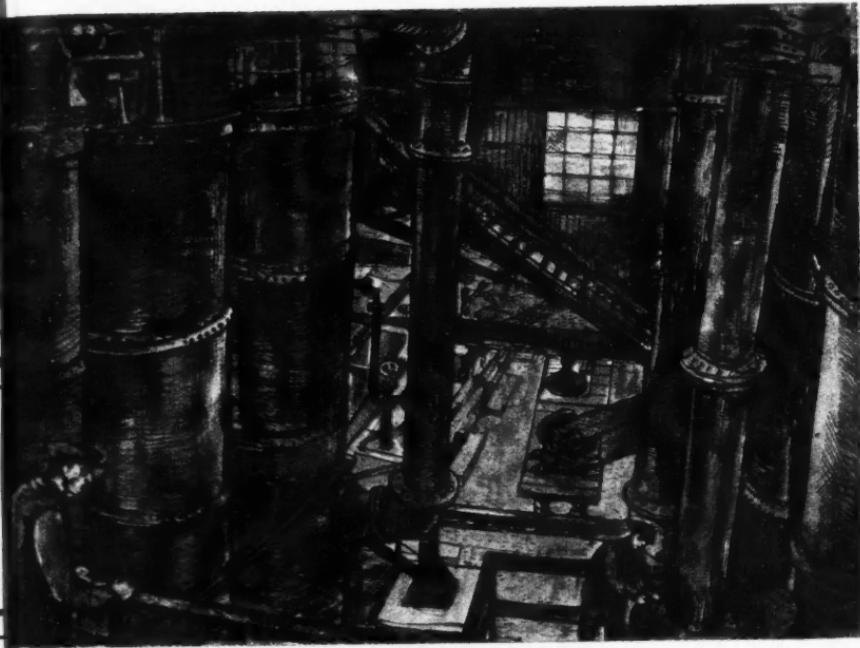
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VOL. LX
No. 1557

14 May 1949

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Chemicals at the BIF

YESTERDAY witnessed the ending of the current British Industries Fair, bringing with it the familiar eagerness to form some estimate of the practical results which may be expected to accrue from the 28th exercise in the art of presenting a national shop window to the world. Viewed from that standpoint alone, the Fair, it is safe to predict, will have proved abundantly worth the very great effort by all concerned and the very substantial expense to which all exhibitors have been committed, having presented once again to peoples of many countries a view in the round of the diversity of skills and the almost phenomenal ingenuity of which the industries of this country are capable. There were 3018 foreign buyers on the opening day and the daily attendance from overseas at the three centres was 500 larger than in 1947.

Inventiveness, gaining stimulus from the increasingly competitive character of international trade and the pressing urgency of gaining markets now, and a heightening of what is conveniently conveyed by the omnibus term of craftsmanship have undoubtedly been the distinguishing marks of this Fair. That, in the present critical stage reached in the reorientation of trade between nations, is likely in the long run to be greatly more valuable than many spectacular orders of the kind which were recorded, especially in 1947, when the world's need of almost everything

required for civilised existence was mocked by the disordered state of supplying industries in the countries which had not long thrown off the paralysis of war or enemy occupation. Viewed as an example of national advertising of the largest and most co-operative kind, the Fair will therefore undoubtedly have justified itself, regardless of the more tangible returns represented by the contracts of which we shall soon be hearing.

To the heavy chemical industries the BIF has never appeared other than as a uniquely valuable occasion for establishing new relationships and cementing the old. Thus a number of inquiries made among chemical exhibitors this week has revealed to be equally true of the 1949 Fair. Basic chemicals and intermediates, handled in many cases not in tons but in ship-loads, are not the subject of casual sale—any more, in fact than are the fine chemicals and drugs of the other sector of chemical industry. For that reason, those seeking to hear of large increases in export chemical trading resulting from the gathering of representative buyers of many nations at Olympia and Earls Court will be disappointed. That rule applies with rather less force to the brilliant and arresting review of highly developed scientific appliances presented by members of the Scientific Instrument Manufacturers' Association, and even less to the Birmingham display of chemical plant and mechanical

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handling equipment, which technical advances in processes and design as well as the world's urgent needs render capable of commanding spot sales.

The current relationship of chemical industries to the BIF seems to have found one expression in the fact that there have been actually fewer chemicals to be seen at Olympia in the past two weeks than at any previous Fair. The visiting chemist will not have been deceived by the sparse showing of the "goods," knowing that to perceive the real capacity of British chemicals in 1949 one need only look around. Invisibly, they have provided almost the entire fabric upon which the technical excellence of the 1949 displays is founded. This year the fact is fully recognised that fertilisers, acids, chemical intermediates and the rest do not lend themselves effectively to public exhibition, and those who studied the fewer examples at Olympia of the direct method of display may have pondered how even the initiated can perceive any characteristic difference between—for example flasks of oleum and of 98 per cent sulphuric acid. The same may be said of nearly all chemical materials and it explains the apparent anomaly represented by their entire absence from the stands of some of the largest suppliers. Their

place at Olympia this year has been taken by photographs, which tell their story far more explicitly, by the consumer goods in which they are used, and by symbolism.

These are among the factors which reasonably can be assumed to have helped reduce the number exhibiting in this year's chemical section to the smallest total since the war. The very substantial increase in the cost of rent and maintenance of a stand is another. While the 69 exhibitors have again most effectively filled nearly 25,000 sq. ft. of Olympia's space, almost the same area as last year and some 500 sq. ft. more than in 1947, it is significant that the number of exhibitors has dropped by 12 since 1948 and is 19 fewer than in 1947. Whatever the section has lost in variety has been compensated by the good use which the large specialists and chemical groups have made of the increased space available to them. No one has been "crowded out"; the Export Promotion Department vouches for the fact that none applying for space in the chemical section was refused. The outcome has been the most dignified and orderly grouping yet achieved, in which all the emphasis has been upon hospitality and facilities for discussion rather than upon chemicals.

NOTES AND COMMENTS

Engineering Research

CHEMICAL engineering science and the technology of chemical plant construction have never enjoyed better prospects for advancement than are now beginning to take shape. In both connections the hopes are centred in the new interests of the Department of Scientific and Industrial Research, whose latest description of what is proposed at its mechanical engineering research laboratory, taking shape at East Kilbride, Glasgow, discloses that much of the work there will be concerned with the problems which have always been peculiarly those of the chemical plant manufacturer and the chemical engineer. That and the acceptance of the principle that chemical engineering should find a place in its research programme must soon add greatly to the close relationship which the DSIR already has with chemical industry, and both proposals seem capable of bringing the most encouraging rewards in the field which the department is designed to serve—the increase of technical efficiency in industry.

Chemical Plant Problems

WHAT is proposed at East Kilbride is not very different from the sort of research programme which a chemical plant manufacturer might well have designed. It is proposed, for example, to erect first of all the hydraulic machinery department where all the problems of basic and applied research on behaviour of fluids will be attacked and special apparatus provided for the accurate calibration of industrial fluid flow meters. Equal priority is to be given to the projected heat transfer laboratory where the problems which nearly all industrial plant shares in some degree with chemical processes will be dealt with analytically and experimentally and some full scale tests will be undertaken. No less interesting from the point of view of chemical plant construction is the other main field of investigation proposed in Scotland, the behaviour of engineering metals under conditions of stress and heat, with special regard to the persistent difficulties which are presented by "creep."

Men and Machines

THE worth of applied psychology, the youngest of the sciences, in the industrial workshop is one of the unknown quantities about which authentic data are hard to come by. That it has a serious part to play in reconciling the innate conflict between men and industrial machines is not now generally doubted, but its fuller acceptance has been delayed by untimely claims for more than it could perform. It augurs well for future development of the methods of psychology in industry that authorities such as Sir Frederick Bartlett, director of the Psychological Laboratory at Cambridge University, are presenting the subject afresh to those who will have to apply it, bereft of some of the optimistic beliefs that have clouded the image it presented to critical observers. One of the things which Sir Frederick Bartlett lately revealed—giving the annual Mather Lecture before the Textile Institute—is that the belief that there are almost indefinite possibilities of assessing "skill potentialities in terms of very simple discrimination thresholds" is unfounded. He said in effect that, while the capacity to perform complex functions cannot be measured by the rule-of-thumb measures of psychology, there was an immediate need for more intelligent designing of industrial tools and machines, making use of the widened knowledge of human reactions to repetitive machine operations. That is not a problem with which heavy chemical industry is very intimately concerned, but there are many other aspects of the research being done at Cambridge which deserve the respectful attention of all industries employing large sections of the national labour resources. Time and motion study is only one aspect of these promising studies.

Pooling Heat and Power

WHATEVER is the direct outcome of the recent Institute of Fuel conference on combining heat and power supplies, the display it produced of authoritative opinion in favour of the "sharing" principle should stimulate many who have been tentatively studying some such collaboration between their own and neigh-

bouring works. It is quite certain that the current basis of steam raising, space heating and generation of electricity represents one of those very rare situations in which "private enterprise" leaves much to be desired. The only ground on which the experts appear not to be in agreement is the scale on which the generation of heat and power should be integrated. The two predominant views are well represented by Mr. A. E. Partridge's advocacy, from the mechanical engineer's point of view, of the complete integration of the heat and power resources of an entire district, and Dr. G. E. Foxwell's proposals for wider use of pooling "by neighbouring industrial plants" and the organised recovery of all possible trade waste capable of generating heat. The former seems at the moment to be the likely and most logical solution when a recognisable Government policy in this regard is finally revealed. That, however, is unlikely to be so near at hand as to invalidate Dr. Foxwell's case for corporate enterprise on the smaller scale. Two electrical engineers at this fuel conference, Messrs. L. D. Anscombe and A. J. Ellison, swept aside the technical difficulties which have been the nominal basis of the refusal of electric supply undertakings to purchase surplus electric power from industrial plants. They concluded that no great technical difficulty can now arise through the use of the public supply system as a means of interchanging surplus power between neighbouring works. The current may be generated by a synchronous generator driven by steam turbines of the back-pressure, steam pressure or other types. The design of the steam and power plant visualised by Mr. Partridge is stated to present no heavy fuel or engineering problems and could be readily adapted to afford the hourly ratio of 24 lb. (steam)/1 kW suited to a large grouping of diverse industries.

U.S. Aid for Steel

THE truth that steel production is the basic element in all plans to bring new life to industries of all kinds does not need to be propagated with special emphasis in Great Britain. Steel rationing has ensured that all are only too well aware how urgent is the need, and the record-

breaking drive by the steel industry has been equal to the occasion. That this problem is shared by Europe, as represented by all the OEEC countries, is confirmed by the latest survey by the ECA which sees in the phenomenally rapid growth of European steel capacity since the war the greatest stimulus of economic recovery as a whole, and regards the industry as the most promising field for international co-operation and Marshall Aid. Total steel output of the OEEC countries in 1948 was approximately 40 million metric tons, that is to say, some 30 per cent more than the previous year's total and very little less than the 1935-36 average. As 1948 ended, combined steel production—excepting Western Germany—was 6 per cent better than in the "bumper" year of 1937. Iron and steel plant and materials are accordingly to receive a major share of ECA funds, the equivalent of some \$3.1 billion, of which a considerable allocation is expected to come to the Steel Company of Wales. If British steel becomes a State monopoly and at the same time a recipient of large American investment some current Labour policy in industry will have to undergo further drastic revision. To most Americans tonnages and costs speak louder than social experiments.

STEEL TOTAL IN APRIL

OUTPUT of steel in April was slightly lower than March, the month being affected by the Easter holiday period. Production nevertheless reached the highest figure ever attained in April, being at an annual rate of 15,854,000 tons compared with 15,283,000 tons in the same month of 1948.

Pig iron output, which was restricted by a number of furnaces being relined, was at the annual rate of 9,288,000 tons, compared with 9,433,000 tons a year ago and 9,295,000 tons in March, 1949.

Comparative figures were:—

	STEEL INGOTS AND CASTINGS (Thousands of tons)			
	1949		1948	
	Weekly average	Annual rate	Weekly average	Annual rate
January	288	15,002	280	14,589
February	311	16,176	289	15,049
March	312	16,269	290	15,117
April	304	15,854	293	15,283
PIG IRON				
January	178	9,262	167	8,726
February	181	9,422	176	9,169
March	178	9,295	178	9,303
April	178	9,288	181	9,433

I.C.I. SETS UP NEW RECORDS

Big Increases in Production, Exports and Profits

PRODUCTION records were broken, frequently with big margins, in nearly all the divisions of Imperial Chemical Industries, Ltd., in 1948. This is the note which recurs many times in the directors' annual report, to be submitted to members at the 22nd annual general meeting on May 31. It discloses that the company's turnover last year was larger than anything previously recorded and was approximately twice as large as in 1938.

The effect of the greatly increased production in most directions has been to permit the abandonment of many of the systems of rationing customers, although home demand has generally been maintained on an exceptionally high level. Limitation of customers' supplies of soda ash ceased in the last three months of the year and substantial quantities were made available for export, aided by the larger supplies of better grade coal and the extension of alkali producing plant at Northwich, of which the first stage has now come into operation.

£13 M. for Alkali

The prospect of very much greater supplies is contained in the record that a start has been made on the second stage of the alkali development scheme on which a further £13 million is to be spent in the next few years.

The world-wide shortage of caustic soda is reflected in the fact recorded in the report that, although output was twice as large as in 1938, exports had to be severely restricted to safeguard supplies to home industries.

The report bears testimony of widening production and expanding capacity in nearly all the basic chemical divisions. The General Chemicals Division raised its chlorine output by 30 per cent and is aiming to achieve further increase in anticipation of heightened demand. Twelve per cent more sulphuric acid was produced in the course of the year.

Virtually the same trend is shown in nearly all the instances given. The Lime Division by mechanisation in its Derbyshire and N. Wales quarries raised the output of limestone per worker by 70 per cent. Total sales of the Salt Division exceeded 500,000 tons for the first time since 1939. The Dyestuffs and Pharmaceutical Division raised dyestuffs production by 25 per cent and other products by more than 50 per cent. Penicillin, in particular, now employing the deep culture process, was produced

in quantity five times as large as in 1947. Twelve records were broken in the Birmingham Division, the products concerned including fertilisers, nitric acid, refrigerant, plaster board, and anhydrite.

The Nobel Division at Ardeer broke the record established in 1947 and secured a 30 per cent increase in its exports, which represented nearly half the total trade. Direct exports of the Paint Division were doubled.

Virtually the only sections giving evidence of less buoyant conditions in 1948 were the Metals, Leathercloth and Plastics Divisions.

Exports Produced £37 M.

The financial results of all these productive increases are reflected in the fact recorded in the accounts that consolidated sales turnover totalled £167 million, compared with £137 million in 1947. Direct exports represented nearly a third of all sales and realised more than £37 million, an increase of rather more than £9 million. The consolidated income of the parent company and its 87 subsidiaries totalled £22,955,579 (£17,208,225 in 1947), of which almost exactly half was absorbed by taxation—£11,058,523. Thus net profits of the group were £10,850,414, compared with £7,646,933 in the previous year.

Oil Prices Reduced

£20 Less for Linseed and Castor Oils

THE Minister of Food has announced that during the four-week period ending June 4, 1949, the following alterations in the prices of unrefined oils will take effect:

Linseed oil, from £170 to £150.
Linseed oil roots, from £120 to £100.
Castor oil crude firsts, from £142 to £122.
Castor oil crude seconds, from £135 to £115.

All these substantially reduced prices are per ton, naked, ex works.

Sunflower acid oil will revert from £58 per ton to £92 per ton naked, ex works. Any supplies of mixed sunflower/whale oil acid oil which may be available will be sold at £58 per ton.

The prices of all other unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users will remain unchanged.

£4.1 M. for Clyde Steelworks

Big Expansion for Colvilles

COLVILLES, LTD., has decided to go ahead with one of the largest schemes of expansion ever promoted in Scottish metal industries at a cost of £4.1 million, regardless of the prospect of nationalisation of the industry. The scheme involves extensions at the Clyde Ironworks and the Clydebridge Steel Works, on opposite sides of the River Clyde, to be linked by bridge and piping to create an integrated unit. These developments are intended to make one of the most efficient steel plants in Great Britain.

A major feature of the new plant at Clyde Iron Works, to cost £2.1 million, is the creation of a battery of 68 coke ovens, linked with a by-product recovery plant. This project, on which work has begun, will double the existing oven capacity and make good the shortage of coke which has hampered production. Coke has been brought mainly from Yorkshire to maintain the three blast furnace units in continuous production. The by-product plant will be extended at the same time to incorporate late developments, thereby giving a more finished range of products including some for the plastics industry.

The new extension at Clydebridge will increase ingot capacity to about 525,000 tons per annum. Included in this project are two 300-ton tilting furnaces, a battery of soaking pits and a new bay for modern handling of the firm's output.

LANARKSHIRE DISTILLATION PLANT

A CONFERENCE is being called in Glasgow this month at which the Scottish Reconstruction Committee will again advance the plan for a coal and chemical distillation plant in Lanarkshire.

At the annual conference in Glasgow, Mr. William Boyle, vice-chairman of the committee, forecast that the proposed plant would cost about £500,000. It would have an intake of 150,000 tons of coal per year and give 110,000 tons of solid smokeless fuel, and 375,000 tons of crude benzol annually, the latter as the source of valuable chemicals.

This scheme has been under discussion for a number of years but has found little official backing. At present, the National Coal Board is transferring miners from Lanarkshire to Fife and would obviously show little enthusiasm for any project which demands the retention of the labour force in what is regarded as an area of diminishing production.

Oxygen Charges Cut

Bulk Output at \$3.5 per Ton

TESTS of a new process for the commercial production of low-cost oxygen from air have been successfully completed at the first commercial plant in America ever to use the process, Glen McCarthy's Chemical Company at Winnie, Texas. It employs the process elaborated by Hydrocarbon Research, Inc., New York. The plant has been producing more than 20 gross tons per day of 90 per cent oxygen for the synthesis of methanol, formaldehyde and other petroleum chemicals.

In large quantities, the process is claimed to be capable of making oxygen available for as little as \$3.50 a ton, a price which permits oxygen to be grouped with steam and electric power as an industrial utility.

Meanwhile, it is announced that a second plant which will use the process is being built for the Carthage Hydrocarbon Corporation, Brownsville, Texas. Expected to be in operation later this year, it will have a capacity of 2000 tons of oxygen per day.

BY-PRODUCT CHARCOAL

THE possibility of substantial revival of the charcoal industry in Perthshire and Angus is foreshadowed by current activity of James Macdonald and Son which is supplying to several of large chemical undertakings charcoal which is a by-product of the firm's saw mills. Two charcoal burners were installed at the firm's Baronyhall sawmill two years ago to use waste hardwood. So large was the demand that now 19 burners are in action, following the felling and utilising all the waste material. Charcoal tar, a by-product of the burning, is to be developed in the area and may become available commercially fairly soon.

NATIONAL RESEARCH DIRECTOR

APPLYING to a question by Mr. A. R. Blackburn in the House of Commons on Monday, the President of the Board of Trade said he was not yet able to announce the appointment of the chairman or any member of the National Research Development Board except the managing director. Lord Halsbury, now research manager and works manager of Decca Record Co., Ltd., had accepted his invitation to become the managing director of the corporation as soon as it could be set up.

"I could not have found a man whose gifts and training more fitted him for this post," said Mr. Wilson.

Six directors, including the chairman, had still to be appointed.

Chemical Plant in Miniature

AN exhibition, which sets out to illustrate the wide range of scientific and engineering services rendered to world industry by the companies of the Simon Engineering Group, is being held at its London offices, 6 Stratton Street, Piccadilly, W.1, and will continue for several more weeks. It comprises photographs and scale models of typical post-war contracts executed by the group in some 40 countries in nearly every part of the world, including the important currency areas of Canada, the U.S.A., South Africa, Argentina, Portugal, etc.

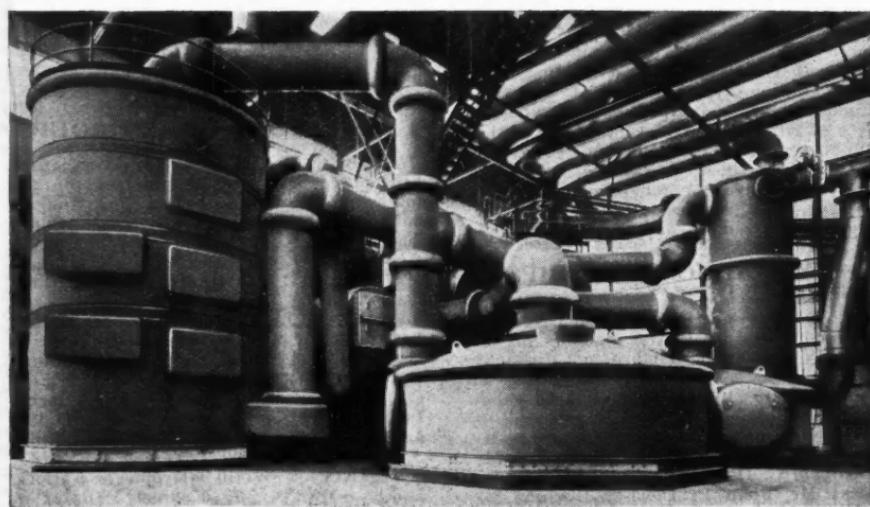
The principal work of the chemical plant department of Simon-Carves, Ltd., at the group's chief works at Cheadle Heath, near Stockport, Cheshire, is the building of contact plants for the production of sulphuric acid. The firm claims to have built nearly all the sulphuric acid plants erected in Britain during the war for Government explosives factories and private industry, and to have received most of the contracts for new contact sulphuric acid plants in this country since then. Three large plants, each producing 110 tons of acid per day, have recently been commissioned from this firm for erection in Manchester, Grimsby and Switzerland, respectively, and work is now proceeding on a dozen more for Britain.

A large volume of work is carried out by Simon-Carves, Ltd., in the building of gas by-product plants, for gas cleaning and by-product recovery and refining. Another important part of the department's activities is the building of electrostatic precipitators for the removal of dust, acid mist, tar, etc., from gases of various kinds and for the extraction of fine grit and dust from power station chimney gases. These are among the chemical engineering processes now being represented in miniature with a great wealth of detail at the London exhibition.

CHEMICAL EMPLOYMENT

ONLY a slight increase in the number of persons employed in the chemical and allied trades in Great Britain was recorded in February this year. According to the *Ministry of Labour Gazette* for April, sectional distribution of labour was as follows:—

Industry	Thousands		
	Feb., 1949	Jan., 1949	Mid-1948
Coke oven and by-product works	17.6	17.5	17.3
Chemicals and dyes	196.6	196.4	195.5
Pharmaceutical preparations, etc.	32.0	32.1	30.8
Explosives and fireworks	36.2	35.5	33.8
Paints and varnish	111.6	111.0	106.5
Total chemicals, etc.	431.1	429.6	420.9



One of the larger engineering schemes which were represented by photographs at the London exhibition, a Monsanto contact sulphuric acid plant constructed at Manchester for Courtauld's, Ltd.

Mycological Chemistry

Widening Scope of Biosynthesis

THE Bakerian Lecture, which was initiated in 1775, was given at the Royal Society, London, last Thursday, by Prof. H. Raistrick, who dealt with the now rapidly growing subject of mycological chemistry, particularly in relation to the powers for synthesis of the micro-fungi.

Up to 1923 little attention had been paid to this subject. In that year, the lecturer and his colleagues began work on it in the research laboratories of Nobel's Explosives Co., Ltd., Ardeer, Scotland.

It had been continued since 1929 in the London School of Hygiene and Tropical Medicine, and during the last ten years in a number of other laboratories.

The general plan of the work was the investigation of the products of metabolism of pure cultures of species and strains of micro-fungi when grown under controlled conditions on simple, reproducible and chemically defined culture media, containing, in addition to mineral salts, only glucose or glucose and tartaric acid as the sole source of carbon.

A large number of fungal metabolic products had been isolated in a pure state and in many cases their chemical constitutions had been determined, so that it was now possible to trace to some extent the inter-relationships in chemical structure between the different types of metabolic products, and to present the rudiments of a scheme suggesting how some of them might be produced by biosynthesis.

This theme was developed in relation to the following types of fungal metabolic products. Aliphatic compounds: derivatives of tetrone acid and citric acid; other non-benzenoid compounds. Aromatic compounds: substituted benzene derivatives; derivatives of toluquinone naphthaquinone, anthraquinone and xanthone. Organic compounds containing chlorine.

SIX U.S. SCHOLARSHIPS

THE Massachusetts Institute of Technology has granted scientific and technical scholarships to six British students for the summer course in Cambridge, Massachusetts, beginning on June 6 and ending on September 16, 1949. More than 35 candidates applied.

The six successful candidates are:—Mr. David D. Carrow, West Amesbury; Mr. Archibald C. Doherty, Norton, Stockton-on-Tees; Mr. John F. Dowler, Buxton; Mr. John H. Harlock, St. John's College, Cambridge; Mr. Frederick J. Hyde, The University, Edgbaston, Birmingham; Mr. Peter Godfrey, Thames Ditton.

Society of Chemical Industry

Nutrition Panel's Active Year

THE vigour of the Nutrition Panel of the Society of Chemical Industry was well maintained during the year, records the current summary of 12 months' activities, issued by the group. In all, seven scientific meetings were arranged, and a new series of meetings was inaugurated. In the course of this series, which has been entitled "The Nation's Manufactured Foods," it is planned to discuss in turn each of the more important types of manufactured foodstuffs. The first meeting was held in January.

On the initiative of the panel committee and in conjunction with the committee of the Biological Methods Group of the Society of Public Analysts, a survey has been made of the fiducial limits acceptable to bioassayists in the assay of vitamin D by means of rats. The results of this study constitute the first authoritative statement on this matter.

Arrangements for five meetings have already been made, two of these will be further symposia in "The Nation's Manufactured foods" series. Other meetings cover the nutritional significance of vegetarianism, an up-to-date review of vitamins, and the influence of genetic factors on nutritional values, of animal products and crops.

The membership of the Nutrition Panel has increased by 37 during the year and now stands at 331.

LABORATORY WARE GROUPS

The British Laboratory Ware Association, Ltd., announced the appointment of the following officers to serve for the 12 months ending January 31, 1950: Chairman: MR. NORMAN TREPTE, (W. & J. George & Becker, Ltd.); vice-chairman: MR. J. E. C. BAILEY (Baird & Tatlock (London) Ltd.); council: MESSRS. R. BARRINGTON BROCK (Townson & Mercer, Ltd.), H. CLIFT (Thomson Skinner & Hamilton, Ltd.), T. A. DRYDEN (T. Dryden), C. K. FAULKNER (James Woolley, Sons & Co., Ltd.), E. C. NEWMAN (Philip Harris, Ltd.), A. W. A. RUNDLE, chairman, 1947 and 1948 (A. Gallenkamp & Co., Ltd.), J. S. TOWERS (J. W. Towers & Co., Ltd.), N. MCKINNON WOOD (Griffin & Tatlock, Ltd.). MR. S. J. KENNEDY (Baird & Tatlock (London) Ltd.), has been elected convener of the technical committee in succession to R. H. POWELL (Griffin & Tatlock, Ltd.).

Crystal Growth

Attempts to Reconcile Theory and Practice

From a Special Correspondent

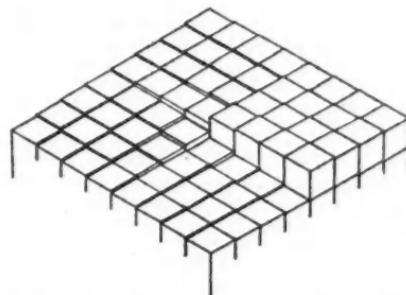
THE Faraday Society's discussion on crystal growth, in Bristol recently, made it clear that there is still a wide gulf between theory and experiment. A very valuable service was therefore performed in bringing together the theorists and those whose daily concern is with growing crystals.

The point of closest approach between these two groups was on the question of nucleation, where, although no significant theoretical advances have been made for about ten years, current experimental work shows signs of bearing out many of the theoretical predictions. Even here, however, there are still wide discrepancies.

Once nuclei are present, numerous problems arise concerning the mechanism of subsequent growth. Two theoretical treatments of great interest were advanced by the Bristol workers Burton, Cabrera and Frank.

Burton and Cabrera showed that the growth of a crystal face occurs by deposition at kinks in the edges of monomolecular steps and that at low supersaturations a two-dimensional nucleation process must occur before each new layer of atoms can be deposited. Frank introduced the idea that screw dislocations of the type familiar in metals will provide self-perpetuating nuclei of the kind required by Burton and Cabrera. This means that only imperfect crystals will grow.

There is a strong superficial resemblance between the picture of crystal growth thus obtained and the actual observations of Bunn, and others, of crystals growing from highly supersaturated solutions on a microscope slide. Excellent films have been made of these experiments in which layers can be seen to grow outwards, usually from some point in the centre of a crystal face. However, these visible layers are many hundreds



The end of a screw dislocation, forming a self-perpetuating step at which growth can occur

of atoms thick, and the Bristol workers' theory in its present form only concerns monomolecular layers growing from solutions of low supersaturation.

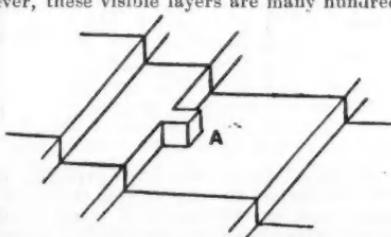
The influence of adsorbed dyestuffs on the habit of crystals grown from solutions was dealt with in several papers, but no general rules could be formulated to explain or predict the effects of different dyes on different crystals.

For example, the effects of four dyestuffs on the habits of ammonium sulphate and nitrate and potassium nitrate are shown in Table 1.

Dye	INFLUENCE OF DYESTUFFS		
	NH_4NO_3	$(\text{NH}_4)_2\text{SO}_4$	KNO_3
Amaranth	Strong	Strong	Very slight
Tartrazine	Negligible	Strong	Moderate
Acid Magenta	Strong	Negligible	Negligible
1: Diamino-anthraquinone 2-sulphonate	Strong	Negligible	Strong

In all cases where the effect is strong thin plates or laths are produced instead of the normal habit. An interesting application of this effect has been made in the case of ammonium nitrate. When stored in bulk this material absorbs moisture from the atmosphere, producing a film of saturated solution which is concentrated by capillary forces around the points of contact of the crystals. Subsequent drying or temperature variation results in partial recrystallisation and microcrystalline bridges are formed which cement the granules together so that the original powder becomes a solid cake.

This caking can be completely prevented by the addition of 0.1 per cent of acid magenta. Caking of ammonium sulphate



Theory asserts that a crystal can grow only by deposition at the kink A

and potassium nitrate can be prevented by similar additions of amaranth and 1:4 diaminoanthraquinone 2-sulphonate respectively.

It would appear that the very thin plates or laths which result on the crystallisation of liquor containing these dyes have such a low mechanical strength that they are unable to cement the granules together. No dye has been found which reduces the caking of sodium nitrate, and it is significant that none has been found to modify the habit of sodium nitrate crystals grown from aqueous solutions.

Strain as an Accelerator

The questions of the pressure exerted by growing crystals, and the effects of stresses on rates of growth were discussed. It was shown that ammonium nitrate crystals grow slightly faster when strained by bending than unstrained crystals, but that the effect soon disappears once an appreciable amount of salt has been deposited.

Of interest to organic chemists was the fact reported by Dr. McCrone, of Chicago, that strain may influence the melting point of certain organic compounds very strongly. For instance, the melting point of octochloropropane can be lowered as much as 20°C. by strain. Only six compounds have so far been found to exhibit this effect, one of them being Vitamin K.

Another topic of discussion on which much work has been done in recent years was that of the orientation of crystals of one substance growing on a substrate of another substance. Examples of this are numerous, but so far the phenomenon is of limited industrial significance.

In the crystallisation of sugars it is found that the use of certain aluminium alloy vats causes orientation of the crystals growing in contact with the metal. Theoretical studies suggest that this subject may be of considerable importance in the surface oxidation of metals.

The final session of the discussion was devoted to consideration of the problems of mineral synthesis and the commercial growth of large crystals. Two papers on problems of crystal growth in cements and other building materials were also presented.

The growth of crystals of ammonium dihydrogen phosphate (ADP) and of lithium sulphate (both of which are used as piezoelectric oscillators) from aqueous solutions has been brought to a high degree of perfection. ADP crystals about 12 in. long and $1\frac{1}{2}$ in. in maximum width were exhibited by Mr. Robinson, of the Royal Naval Scientific Service. These are grown on seeds supported on arms which oscillate in the solution. The latter is slowly cooled

from 50°C. to room temperature over a period of 4 to 5 weeks.

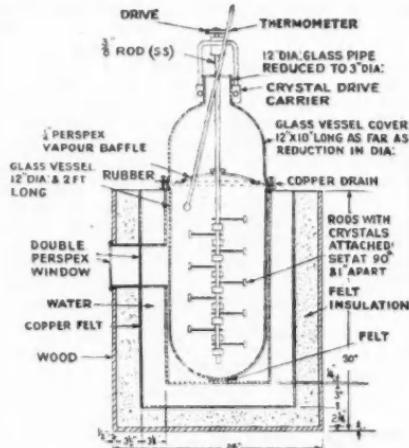
Lithium sulphate has a small negative temperature coefficient of solubility and is therefore grown by controlled evaporation of the solution at constant temperature. In both cases crystals grow at various rates in the same solution, and it is always the slower growing ones which are most perfect.

Some control of the habits of the crystals in order to fulfil the electrical requirements is achieved by the addition of various impurities at different stages of the growth. In the case of lithium sulphate the habit is affected by the pH of the solution.

To obtain crystals of suitable girth a pH of 4.5 is used, and when this has been attained lengthwise growth is encouraged by increasing the pH to 6.7. The success of the technique depends mainly on the accuracy of the temperature control and the purity of the starting materials.

In contrast to the success achieved with these water-soluble crystals, progress in the growth of quartz, also required for its piezo-electric properties, has been comparatively slow.

The only method which has proved practicable is known as the hydrothermal process. It involves heating vitreous silica in an autoclave with water and a mineraliser at temperatures and pressures near the critical point for water. A seed crystal of quartz is suspended in the vessel, and owing to the higher solubility of the vitreous



A 35-litre vessel for the growth of LiSO_4 crystals in which the liquid is maintained at 80° C. and condensed vapour withdrawn via the copper drain

(The three figures illustrating this article are reproduced by courtesy of the Faraday Society)

silica under these conditions growth occurs on the seed.

Growth is slow and often imperfect, and to produce crystals large enough for use as oscillator plates it is necessary to employ four or five successive depositions because the amorphous silica in the autoclave devitrifies during the heating, giving a polycrystalline mass of quartz and cristobalite.

The Verneuil technique used for the production of synthetic corundum for instrument and watch jewels has been successfully applied in the Crystal Section of the U.S. Naval Research Laboratory to a number of other minerals including rutile (TiO_2), scheelite ($CaWO_4$) and mullite ($3 Al_2O_3 \cdot 2SiO_2$).

In this method powdered material is fed through an oxy-hydrogen flame, and the crystal slowly lowered out of the hot zone as it builds up. Crystals of rutile up to 75 carats have been obtained and this material is now being grown commercially as a gem stone.

It would appear that this technique, in skilled hands, is a very versatile one and should allow the growth of many crystals with high melting points, provided that they do not undergo any phase transitions between the melting point and room temperature.

Producing Optical Crystals

The relative merits of the three standard techniques for growing crystals for optical purposes were discussed at some length. For large crystals some 9 to 12 in. in diameter there seems to be little to choose between Prof. Stockbarger's method, in which the melt is lowered through a controlled temperature gradient, and the Kryopoulos method in which the furnace temperature is slowly reduced and growth takes place on a suspended seed crystal.

The Stöber method is probably the simplest and is suitable for small crystals one or two in. in diameter, but cannot be used successfully for the very large melts. In this method growth is induced from the bottom of the melt, which is heated by radiation from above, and proceeds by controlled variation of the temperature gradient.

The Stockbarger method has been considerably refined, and it is now possible to grow calcium fluoride crystals which are very much larger than any natural material of optical quality. They must be handled with extreme care owing to their high coefficient of expansion and easy cleavage. A thermal shock of 5°C . will shatter a large crystal.

In ceramics and building materials very few special studies of crystal growth have been made, and although the importance of

this aspect is now recognised it is not possible to make any generalisations. Two points may perhaps be mentioned as examples of the diverse uses of the phenomena of crystal growth.

The setting of plaster of paris is normally accompanied by an expansion of the mass although in fact there is a 70 per cent decrease in the volume of the solid, and a consequent increase in the volume of voids in the interior. This is attributed to the unidirectional growth of the interlocking hydrate crystals. If certain agents which modify the crystal habit are present in the water this expansion can be almost completely eliminated.

Periclase Crystals

The second example concerns the use of periclase (MgO) in refractory bricks. The magnesia used for these bricks must be calcined beforehand at temperatures above 1600°C . If this is not done bricks made from it suffer severe shrinkage on firing besides being hygroscopic and eventually are disrupted by atmospheric water.

It was at first thought that the prior firing, known as "dead burning," produced a new crystalline form, but recent work has shown that this is not the case. All that happens is that the periclase crystals grow to a larger size. The reason why these larger crystals should be resistant to hydrolysis is not clear.

It has been found that the presence of limited quantities of certain impurities, notably iron, greatly increases the rate of growth of the periclase crystals, and that this is the reason for the observed superiority of certain natural sources of magnesia.

To sum up, the chief outcome of this discussion will undoubtedly be the stimulation of much new experimental work. If another meeting on the same subject is convened in about ten years' time it is possible that the gap between theory and practice will have been much reduced.

INSTITUTE OF PHYSICS

MEMBERS of the Institute of Physics are to meet next week at Buxton (May 19-21), primarily on a "domestic" footing to enable Fellows, associates, students, and subscribers to get together and learn something of each other's field of work.

An interesting series of papers, discussions, visits and social activities has been arranged and there will be an exhibition for which each of the groups has assembled exhibits—small pieces of apparatus, photographs, transparencies, models—many illustrating subjects to be discussed during the convention.

Fat Splitting

Factors of the Twitchell Process

A STUDY of current observations on counter-current splitting by the Twitchell process of small quantities of fat of different grades formed the subject of a paper presented at the concluding session of the season of the North-West branch of the Institution of Chemical Engineers. Mr. C. B. Cox was the speaker and the branch chairman, Mr. E. J. Dunstan, presided.

The initial reaction mixture consisting of fat, water, sulphuric acid and 1 per cent of sulphonaphthalenic acid emulsifying agent, is heated by open steam to split the fat. After separation of the emulsion into two phases, the water is drawn off, fresh water and sulphuric acid are added to the oil and heating is resumed. The sweet water is separated and the oil is boiled with fresh water to remove mineral acid from the oil.

Some Constants

For any given free fatty acid content of the mixture there is only one concentration of glycerol solution in equilibrium with it, therefore the attainable per cent of f.f.a. depends only on the initial per cent f.f.a. and on the proportion of water. The reaction is monomolecular and the reaction rate is proportional to the concentration of neutral fat in the oil.

Data for the equilibrium and its constant were ascertained experimentally and equations were obtained for the forward and backward reactions. Graphs related the final f.f.a. to the initial f.f.a. and to the ratio of water to initial fat used.

The results were applied to splitting in stages and the ratio of water to fat was fixed to give good efficiency at each stage, when the split is done in minimum time, the water-to-fat ratio varies with each successive boil, but the time is not unduly long when an equal ratio is used on each occasion.

The author described the re-use of sweet water from one boil in an earlier boil of the next batch. The presence of mono- and di-glycerides made necessary some experimental work and it was found that the glycerol transferred from the fat to the aqueous layer varied linearly with the proportion of neutral fat in the fat phase, that is, the relative proportions of mono-/di-/tri-glycerides and glycerol in the fat phase remain substantially constant and independent of the degree of splitting.

An equilibrium equation was derived and was applied to the splitting in stages. In actual practice, the water from the third boil was re-used in the first stage of splitting.

For continuous splitting, it is possible to arrange a series of reactors, the batch from each reactor being allowed to settle and the separated water and fat passing to the next vessel in the series, water and fat passing counter-current to one another. Equations were derived for the time and rate of splitting and for the capacity of the splitting vessels.

The splitting rate for continuous splitting was compared with the three-stage system. It was found that the continuous splitting could not attain the throughput of the three-stage system except by increasing either the proportion of water or the quantity of material in process.

The effect of temperature on fat splitting was found and details for working the process under moderate pressure were given.

1 M. Tons of Crude Trieste Refinery's Enlarged Capacity

CONFIRMATION of reports of Italy's rapidly growing importance in oil refining (THE CHEMICAL AGE, 60, 240) is contained in a report received from the Aquila refinery in Trieste, which lately accepted the millionth ton of crude oil delivered there since the completion of the reconstruction necessitated by the severe bomb damage inflicted during the war.

The reconstruction was started in 1946, the company recalls, and by May, 1947, operations were resumed in the rebuilt atmospheric and vacuum plants, chemical treatment plants and in the accessory installations. At the same time the throughput capacity of the refinery was increased, and to-day it is more than 140 per cent of the pre-war capacity.

Roughly three-quarters of the oil goes to the Italian market and the Free Territory of Trieste, while about one-quarter is exported and sold for bunkers.

The latest figures show that, as far as throughput is concerned, "Aquila" is at the head of Italian refineries. The reconstruction and development of the refinery has enabled it to contribute to the rehabilitation of Western Europe by providing a range of petroleum products and by helping to relieve the bottleneck of refining capacity which existed, and still exists, in Europe, particularly in the Mediterranean area.

Discussions are now proceeding—which are expected to be concluded shortly—for the construction of a modern plant for the production of about 25,000 tons per annum of the full range of 100 VI lubricating oil from Middle East crude. It is expected that this plant will be in full production at the beginning of 1951.

RADIOACTIVITY MEASURING APPARATUS

The Assay of Beta- and Beta-Gamma Active Substances

By DENIS TAYLOR, M.Sc., Ph.D., M.I.E.E., F.Inst.P.

In a lecture given at Reading University to members of the London and South-Eastern Section of the Royal Institute of Chemistry, Dr. Denis Taylor said:—

Several different types of apparatus are used for the radioactive assay of beta- and beta-gamma-active substances. It is convenient to classify these according to whether the measurement is achieved by measuring a direct current proportional to the total ionising effect of the radiation; or whether the apparatus produces a pulse of current for each particle which enters the sensitive volume of the detector, and the measurement consists of determining the rate of arrival of these pulses. The d.c. ionisation chamber is in the first class; the proportional counter and the Geiger-Muller counter are in the latter.

An ionisation chamber consists of a gas chamber containing two electrodes across which a potential difference of a few hundred volts is maintained. The radioactive sample to be assayed is placed inside the chamber, or near the chamber. In the latter case the chamber must be provided with a suitable window (made of aluminium or other suitable material) through which the particles emitted by the radioactive sample may pass.

The Beta Emitter

The beta-particles in the case of a beta-emitter cause the gas to ionise and the applied voltage will cause these ions to move to their respective electrodes resulting in an ionisation current. The saturation ionisation current, which will be of the order of 10^{-10} A^1 or less may be measured using an electronic d.c. amplifier

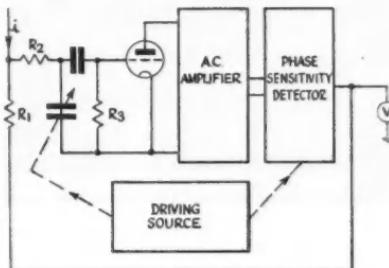


Fig. 2

and gives a measure of the quantity of radioactive material present. A simple form of electronic d.c. amplifier is shown diagrammatically in Fig. 1. The resistance R may be of the order of 10^{12} ohms and with this simple form of apparatus full scale on the meter corresponds to 1 V. It therefore follows that a full scale reading will be obtained with a saturation ionisation current of $1/10^{12} = 10^{-12} \text{ A}$.

The sensitivity of d.c. amplifiers of this type depends upon the zero drift of the instrument. This is of the order of 20 mV. in the case cited and this limits the sensitivity obtainable. By using balanced circuits and other means² it is possible to limit the drift to the order of 1 mV. It is then reasonable to design the amplifier to give full scale reading with, say, 0.1 V and with a 10^{12} resistor this corresponds to a saturation ionisation current of 10^{-12} A .

Vibrating Reed Electrometer

To increase the sensitivity still further it is necessary to employ a vibrating reed electrometer.³ The principle of this apparatus is illustrated in Fig. 2, from which it will be seen that the input voltage iR , is modulated by the vibrating condenser of the a.c. component amplified in the conventional manner. Such an amplifier can be made much more stable than the more usual d.c. amplifier referred to above and the drift per day may be as little as 10 μV . In consequence, it is permissible to design the amplifier to give a full scale reading with 1 mV. and with a 10^{12} ohm resistor this

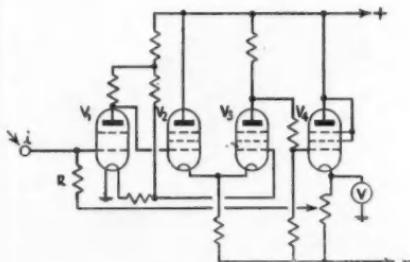


Fig. 1



Fig. 3

corresponds to a saturation ionisation current of 10^{-15} A.

Gas chambers with vibrating reed electrometers are very popular in America for radioactive assay purposes and there seems little doubt that they will be popular in this country once the electrometers are available commercially.

Gas Chambers

Before stating any performance figures a further word might be said about the gas chambers. In some cases, particularly when dealing with weak beta-emitters it is an advantage to place the source inside the chamber. In some cases, also it is an advantage if the assay can be made with the active material as a gas. Thus C^{14} assay can be carried out with the C^{14} as carbon dioxide. The advantages which accrue in this case are (1) constant reproducible geometry is always obtained; (2) there are no self-absorption corrections to apply; and (3) an increased sensitivity (due to better geometry) over solid sample counting is obtained. As an example—in the case of a gas ionisation chamber of volume 300 cc., the background current due chiefly to alpha-contamination in the walls of the chamber was 1.6×10^{-16} A, and using a vibrating reed electrometer and a 10^{12} ohm resistor the instrument recorded 20-30 disintegrations per second of C^{14} .

There is an alternative way of using a gas chamber. The chamber (which may be regarded as a condenser) is charged to a known potential and the quantity of radiation—which is a measure of the amount of radioactive substance present—estimated by observing the fall of potential after exposure to the irradiation. Such a potential change may be measured by an electrometer of either quartz-fibre or the thermionic valve

type. This rate of drift method may be used with a vibrating reed electrometer (the high resistor is not then required) and higher sensitivities than those mentioned above may be obtained. It is usual to employ a recorder which will then show the rate of drift. The sudden changes of potential on the record due to the passage of alpha particles (from the small alpha contamination on the internal surface of the chamber⁴) can be clearly seen on such a record and allowed for. It is thus possible to determine the rate of drift due to the beta-particle emission and apparently a rate of drift due to 1 disintegration per second of C^{14} may be reliably determined.

The quartz fibre type of instrument is particularly useful when very high sensitivities are not required. Fig. 3 shows such an instrument with its beta-chamber. Instruments of this type are much used at Harwell for measuring activities on foils corresponding to 3000-3,000,000 counts/minute.

At the present time Geiger-Muller counters are the vogue in this country for beta-gamma-counting. These devices depend on achieving increased sensitivity by utilising the phenomenon of ionisation by collision in the ionisation chamber. As the collecting voltage is increased beyond a certain value, ion multiplication begins. At first it is proportional to the initial ionisation, but at high voltages the multiplication is such that all pulses have the same amplitude independent of the initial ionising event. Ionisation chambers working under these conditions are known as "proportional" and "Geiger-Muller" counters respectively and the latter will detect the presence of a single ion without elaborate auxiliary equipment.

Electric Discharge

In the Geiger-Muller counter the passage of an ion sets off an electric discharge

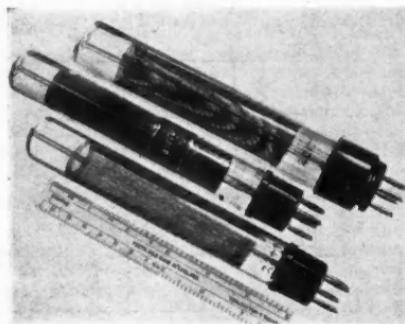


Fig. 4

which has to be quenched in some way so that the next ion may be counted. In some counters, this is achieved using special electronic circuits, but the majority of counters are now of the "self-quenching" type, the self-quenching being achieved by the addition of an organic vapour to the gas filling. The geometry adopted for the counter depends on the type of measurement to be undertaken. This can be best illustrated by referring to particular types of counters.

Fig. 4 illustrates the usual type of tubular counter. In this case the counter comprises a cylindrical cathode and an axial wire anode, the whole being mounted in a suitable glass tube. Fig. 5 shows two end window counters. In the one case the end window has been removed so that the construction can be seen. The windows are usually of mica or dural and commonly have thicknesses as low as 2 mg./cm.² and so are suitable even for the assay of weak beta-emitters.

Fig. 6 shows the construction of counters suitable for the assay of liquid samples. The larger counter is suitable for dipping into the liquid. When the bulk of liquid available is small the second type, in which the liquid to be assayed is placed in the annular space surrounding the counter is very useful.

Internal Liquid Counter

Many special counters are produced. For example, the internal liquid counter was designed to give high efficiency counting. In some cases, particularly when dealing with low energy beta-emitters, the window thickness is such that the efficiency is very low. In such cases, it is an advantage to use a demountable counter in which the solid samples can be placed. The counter is then evacuated and filled with the appropriate gas-vapour mixture before each measurement.

So far I have said little about the auxili-

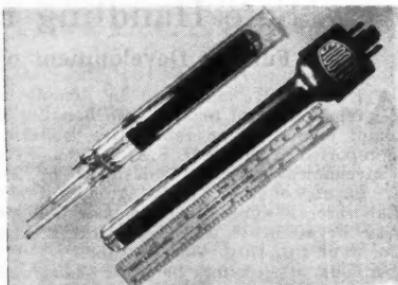


Fig. 6

ary equipment needed, but in addition to the Geiger-Muller counter itself, a lead castle is required to reduce the background to a constant minimum value, an E.H.T. power supply to provide the high voltage for operating the counter, and a scaling unit for reducing the rate of arrival of the pulses to a value which will operate a register (the scaling unit provides a scaling by a factory of 100 in this case and a mechanical register).

There are two ways of using the apparatus. We may determine the number of counts in a given time, or find the time for a given number of counts. These two methods are called "time-controlled" and "count-controlled" operation respectively. In the case of count-controlled operation particularly, it is an advantage to have a piece of apparatus for switching off the scaler after a pre-set number of counts. This is the purpose of centre chassis in the rack of apparatus shown. Count-controlled operation is often preferred, because in radioactivity measurements we are dealing with random phenomena, and as the standard deviation is equal to the square root of the number of counts, the statistical accuracy is the same for all the measurements in this case.

Factor of Proportionality

If N = No. of counts and t is the time of observation, then the amount of radioactive material present is obviously proportional to N/t . The factor of proportionality is determined by the geometry used and the efficiency of the counter. In practice many corrections are necessary to obtain accurate results. There are:

(1) corrections for the background counting rate

(2) corrections for the finite resolving power of the G.-M. counter and associated apparatus

(3) corrections for absorption in the window if this is appreciable

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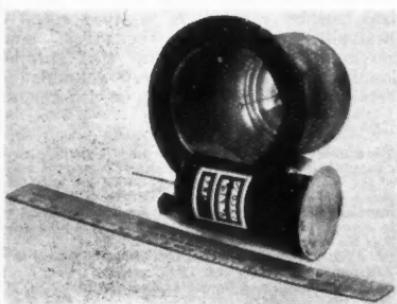


Fig. 5

Safe Handling Hazardous Materials

Further Development of the Remote-Control Method

AFURTHER advance in employing remote-control for the safe handling of toxic, explosive, or radioactive materials is reported from the U.S.A.

Mechanical "hands" designed by Mr. J. Payne, of the Knolls Atomic Power Laboratory, were first demonstrated last year by scientists of the General Electric Co. (THE CHEMICAL AGE, 58, 645).

A new device for handling hazardous products in radioactive chemistry has now been designed by Raymond C. Goertz, at the Argonne National Laboratory's division of remote control engineering, under the direction of Harvard L. Hull.

The new "master-slave" manipulator permits the operator, protected by lead-insulated walls and special optical systems, to view the operations which he controls in safety.

The Argonne manipulator imitates the seven human motions employed in grasping, lifting, moving and turning objects. Mechanical hands are connected in exact synchronisation with two master handles. Three of the seven motions, push-pull, up-down, and sideways, allow the manipulator to move about from place to place. Three other motions provide for rotation about the three axes. The seventh motion opens and closes the mechanical hands.

RADIOACTIVITY MEASURING APPARATUS

(Continued from previous page)

(4) corrections for absorption in the source

(5) decay corrections because of the finite period of the source.

Items (3) and (4) are not important in the case of hard beta and gamma emitters, and item (5) is only important if the time of observation is more than a few per cent of the half life of the isotope in question.

One other question must be mentioned and that is the question of standardisation. Standards are necessary because the efficiency of G.M. counters varies with time and to compare results obtained on one day with results obtained a week or two before, it is necessary to standardise the apparatus occasionally and normalise the results accordingly.

In some cases it is convenient to use a counting ratemeter to replace or supplement the customary scaling unit. In this case the counting rate (i.e., N/t) is given as a deflection on a meter. Counting rate meters are valuable for high counting rates, but where high accuracy is essential parti-



For the purpose of this demonstration by the designer, Raymond Goertz, a glass window was used. In actual operations using radioactive materials this would, of course, be replaced by lead or other dense material and the work would be observed by a system of mirrors

cularly at low count rates, most experimenters still prefer the scaling outfit.

Proportional counters are not much used in this country for radioactive assay of beta and gamma emitters, chiefly because the auxiliary electronic equipment is more complicated. However, they possess a number of advantages—viz:—(1) the resolution loss at high counting rates is down by a factor of 20 or more, (2) a flow type of demountable counter can be used and the flushing time can be very short so that speed of obtainable results can be very much increased. It seems likely that proportional counters will be very valuable for certain types of beta gamma measurements.

REFERENCES

- 1 The number of ion pairs produced per beta-particle may be computed approximately by dividing the average energy of the beta-particle by 30 (since 30 eV are required to produce 1 ion pair). If this number is n and the geometrical factor is 0 , the saturation ionisation current will be approximately $n S = 3.7 \times 10^{19} \times 1.6 \times 10^{-19} A$ where S is the source strength in curies.
- 2 Of AERE Report G/R228, obtainable on request to the Electronics Division, AERE Harwell.
- 3 Palevsky, Swank and Greenhik, Rev. Sci. Inst., 18, 298, May, 1947.
- 4 Korff states that a good chamber has a background of perhaps 10^{-4} alpha-particles/cm²/minute.

DEPRECIATION & MAINTENANCE—X

Problems of Renewal and Replacement

by S. HOWARD WITHEY, F. Comm. A.

THE need for an organised maintenance system is probably greater than it has ever been, and considerable economies can often be effected by using equipment supplied by firms which have undertaken research and development work and are thus able to supply equipment which has a definite field of application.

In the matter of power transmission, for example, two widely divergent types of gear units are available, one being that of a large worm reducing gear for driving, while the other is for a rolling mill drive case built up entirely from steel plates, rolled sections and electrically welded throughout.

Owing to distortion, transmission gears above 2 in. in diameter do not, as a rule, lend themselves to ordinary methods of hardening and an interesting method is the torch process which is suitable for gears ranging from 4 d.p. to 1 d.p.

That economies on a substantial scale can be effected in centrifugal pump maintenance was proved by an examination of the maintenance records kept by companies operating under different conditions. Maintenance charges could be more effectively controlled by the use of equipment which has been specially designed to prevent the renewal of parts and which does not require the use of special tools or gadgets.

Cost of Maintenance

Most of the balance sheets now being submitted reveal the limitations of any single statement of account in that they view company assets as historical records of what has been done in the allocation of capital outlay up to the end of December last, and are intended at the same time to serve as a guide to the current value of the assets, whether as an integral part of a continuing business or for purposes of a forced realisation.

It is not very surprising, therefore, that much criticism is directed to published accounts, as charges made against revenue for depreciation are not necessarily related to changes in the value of particular assets but are usually intended to allocate the capital expenditure over the periods of service or useful life.

From the accountancy viewpoint, depreciation is always regarded as a measure of the exhaustion of an asset or group, arising from continued use or from obsolescence. Use usually has reference to wear and tear on

moving parts and accessories, but in some instances it may denote an exhaustion of available material or a time limit. The demands of efficiency originating from the development of science, investigations and labour-saving devices are constantly accelerating obsolescence, and the problem of estimating the period of effective service life of a section of profit-making plant becomes more acute.

Rapid Obsolescence

When considered from the standpoint of wear and tear, the length of life of a group of assets may be very different from that which is called for by the demands of efficiency and modernisation; consequently, when calculations of depreciation are made, the shortest period should be adopted as the basis for the allocation of capital outlay.

Under existing economic and trading conditions obsolescence is often more important than physical deterioration, and in any case calls for more constant revision. In many instances the degree of obsolescence is too substantial to be met wholly out of revenue, and as more and more productive equipment becomes available for specific purposes and processes, obsolescence will be liable to occur without warning.

In the meantime, the service life of fixed assets will be materially affected by maintenance and renewal, and providing they are suitably recorded and properly classified, maintenance charges are not likely to present much difficulty, so long as the amounts expended are sufficient to maintain the assets in proper working condition. In the chemical manufacturing and engineering industries the annual expenditure on upkeep and repairs totals a considerable sum, and it is usually advisable to institute a method of control by dividing the work into two main classes, one comprising the minor daily repairs and adjustments and the other, the larger maintenance jobs.

While minor repairs may be numerous, they are of a relatively trivial nature. No special authorisation may be needed as the repair men will usually deal with them as the necessity arises, and the cost can be charged against certain standing orders as an alternative to the keeping of separate records of small amounts. For the larger maintenance jobs (and it should be specified that no repair work costing more than a certain amount should be put in hand

without authority), estimates should be filed so that the actual costs can be readily compared and suitable cost sheets compiled.

The disposition of costs is an important matter and the amounts should be classified under three main heads, viz: (1) current repairs and maintenance; (2) improvements to be debited to depreciation reserve; and (3) amounts representing additions to fixed assets to be charged to capital account.

The cost of any job, contract, or engineering operation consists of the outlay in the form of parts; a variety of materials and stores; the wages paid to workers, charge hands, technical and other assistants; and all the expenses and charges incurred, all of which have to be covered before any real profit can be made, and this includes expenditure involved in the maintenance of machinery, plant, tools, equipment and any other wasting assets employed.

In order to be in a position to design satisfactorily and economically, to draw up accurate specifications and to provide means of judging the suitability of specific materials and manufactured goods, chemical engineers and production managers must be quite satisfied regarding physical properties, and in many instances, this is only possible if the material or the finished product has been adequately tested.

Routine Tests

Most of the mechanical properties of metal, for example, can be revealed either by tension, bending, torsion, shearing, or compression tests, and, of course, there are also impact, hardness and fatigue tests which would indicate some special property.

In the case of engines and electric motors, balancing tests will usually ensure that the moving parts are in perfect static and dynamic balance, while for certain classes of engineering work special tests have to be applied as a matter of routine, and there is now a considerable range of machines for the purpose of carrying out a wide variety of tests.

By reasons of high thermal conductivity and low co-efficient of expansion, some refractory materials are much better able to withstand sudden changes of temperature than others. When such properties are fully recognised the articles will undoubtedly be used much more extensively and in greater variety of furnace operations than is the case at present.

There is, however, a period beyond which it does not pay to undertake repairs or to renew parts of an asset, and the problem of depreciation is to provide for that inevitable loss, although the choice of method may be influenced by many considerations.

If it is decided to limit depreciation to allocating the historical cost, several methods of spreading the burden are available and the assumption would be that the object would be achieved if the cash equivalent of the original capital cost is kept intact and that any further funds needed to provide for increased replacement costs would be found either out of undistributed profits, or additional capital contributions.

If, on the other hand, it is decided to build up a special fund in order to replace an asset or section of profit-earning equipment no matter what the cost of replacement may prove to be, it becomes necessary in times of rising prices to charge against each year's profits such an amount as would equal the contribution that would have been made if the original cost of the asset or group had then been at the higher level.

Limit to Replacement

But, while the cost of replacement is a matter demanding the constant consideration of company directors, there is a limit to the extent to which a steep rise in replacement costs can be provided out of earnings, whether the increase in the index of capital goods is due to world conditions or currency depreciation.

Just as companies with old capital assets are penalised in times of falling prices in relation to companies embarking on new equipment to such an extent that nothing short of a writing down of capital values could be effective, so are companies handicapped in times of rising prices when their earnings, which should have resulted from the change in the purchasing power of money, are restricted by the application of profit margins, controls and prohibitions and then subjected to a high rate of tax.

Productive Assets

Company Law in this country assumes that the purchasing power of money will remain constant during the effective life of fixed assets, and company shares are expressed in fixed monetary terms. Consequently, although a general increase in the level of prices will send up the value of a company's assets as shown on one side of the balance sheet, the amount of share capital shown on the other side will remain unchanged. The sum paid for the shares is then exceeded by the current value of the productive assets, and the remedy appears to be that power should be given to write up the book value of fixed assets to fall in line with the rise, in the capital goods index number.

It cannot be disputed that it is the responsibility of company directors and

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New Corrosion Inhibitor

Shell Petroleum's Vapour Protection for Metals

A POWERFUL corrosion inhibitor for the protection of iron and steel and other metals between manufacturing steps, in packages for shipment and during storage has been developed by the Shell Petroleum Company. This synthetic chemical has unique properties that make possible an entirely new method of corrosion-preventive packaging.

This is a white crystalline stable organic compound called VPI which slowly sublimes or vaporises. The vapour—which is odourless, non-toxic and non-injurious to the skin—completely surrounds any article in an enclosed space and prevents corrosion by moisture and air. Direct contact with the metal is not required.

VPI does not function by reacting with, or by removing, moisture or oxygen, but actually inhibits corrosion in its presence, giving positive protection, which does not depend on exclusion of corrosive influences to be effective. Even with punctures or breaks in wrappings, protection continues.

An invisible, thin, protective film is formed on the surface of the metal and this is maintained as long as VPI is present

in the atmosphere surrounding it. Even when moisture condenses, for example, on a steel surface in a very humid atmosphere, corrosion is prevented, because the VPI in the air immediately dissolves in the condensed water film, and only a trace of it is sufficient to make the water non-corrosive to the steel.

From a practical aspect, VPI is not consumed in preventing corrosion and does not act by affecting pH, since it is neutral. The protection afforded by it can be extended over many years, even under severe climatic conditions.

Even this low loss can be further reduced by any barrier to free circulation of air and, indeed, practically eliminated by a simple barrier such as a wax coating or laminated paper.

The new product is available in solid powder form, and that currently obtainable is referred to as Shell VPI 260. It may be applied in this powder form or in solution in water or alcohol, but the most convenient and economic method is by use of coated wrapping materials.

DEPRECIATION & MAINTENANCE—X

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proprietors to provide sufficient reserves to cover all likely contingencies, neither can it be denied that it is the duty of the Government, now that the nation is operating on a new and much higher price level, to grant special relief for the replacement of industrial capital.

It is the function of annual accounts to show a correct picture of the revenue and alterations in capital, and one of the main objects of depreciation charges is to maintain a true record of costs as a guide to sales departments. It is comparatively rare for the amount debited to profit and loss to be identical with the figure included in costs and quotations, for quotations must have regard for replacement costs in order to avoid sudden variations and consequent disorganisation when particular assets have to be replaced.

Taking the long view, it is not sufficient for purposes of costing to treat capital outlay as the correct figure to spread over the processes to which it contributes without regard to alterations in values that may take place, and adequate provision should always be made for depreciation and replacement even though the inclusion of such charges results in the final accounts showing a loss.

The cost of replacement may have to be calculated by reference to an entirely different and modern unit, and in order to keep the results in line with current values a corrective can often be applied by periodical valuations of fixed machinery and plant.

Doubling the initial allowance for plant and machinery bought after April 6, 1949, will encourage firms to spend money on equipment for which prices are very high, for whereas the Income Tax Act, 1945, allowed only 20 per cent of the new cost, the rate will now be 40 per cent, which means that early relief in income tax and profits tax will be afforded, and more money will become available for re-equipment at an earlier date.

In the long run this will, of course, make no difference to the total result as all plant and machinery, in the wear and tear allowances, receives 100 per cent of its cost over the agreed service or useful life of the assets, but the representations from many quarters as to the difficulties which firms and companies have experienced in financing the cost of replacement of old plant, or the installation of more modern machinery, have compelled the Government to acknowledge that the existing scale of wear and tear allowances was inadequate to meet the needs of industry.

(Concluded)



Atomic research, past and present, was represented by characteristic pieces of apparatus on the Ministry of Supply-AERE stand, surmounting which the primitive apparatus with which Cockcroft and Walton first split the Li atom with accelerated hydrogen nuclei recalled the pioneer work in the Cavendish Laboratory

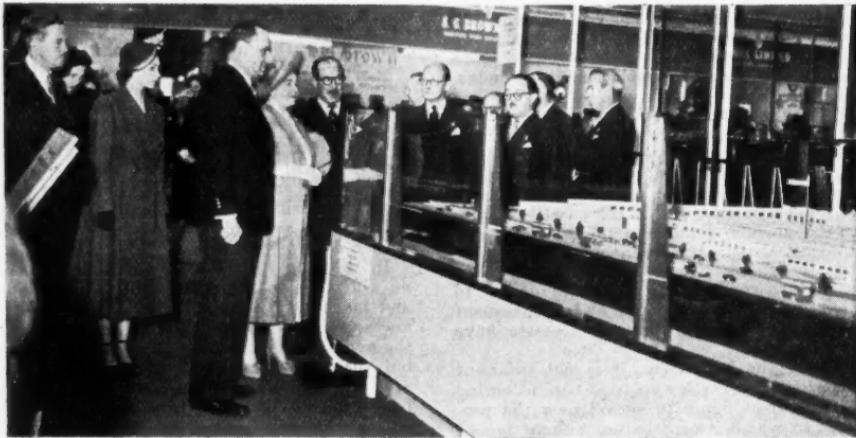
FINAL IMPRESSIONS AT THE BIF

TOTAL attendance at the British Industries Fair in London and Birmingham up to the seventh day (Monday) was: overseas buyers 12,465; home buyers 83,365, and public 74,804. Figures were slightly higher than at the same period of the show last year, and exhibitors on the whole seemed to be satisfied with the trend of business.

In the chemicals section at Olympia it was reported at mid-week that as many orders for export as could be dealt with were being received. At home, it was observed, a buyer's market in heavy chemicals had developed, due to better supplies, more especially of such material as alkali, particularly caustic soda and soda ash.

One of the most difficult problems of the chemical industry has again been to make an attractive and interesting display of "difficult" materials and much ingenuity has been shown in dealing with it. An amusing example was on the stand of Thomas Tyre (B4), where, among many full flasks and bottles, was one large empty flask labelled as ready "to hold the unusual chemical which we are prepared to investigate and if possible manufacture for you."

Notable among the many examples of the use of photo-montage to interpret a branch of the industry in terms intelligible



H.M. the Queen's appreciation of the relative importance of the newer chemicals was evident during the Royal visit with Princess Elizabeth to the chemical section last week. The significance of some of the petroleum derivatives plant was described on the Shell Chemicals stand by Mr. George Legh-Jones (on the Queen's left)

to the casual visitor and of even more interest to members of the trade was the presentation of their two main products—precipitated calcium carbonate and citric acid—by John E. Sturge, Ltd. This sequence of photographs realistically represented the progress of raw material from its source in a Derbyshire crag to the ultimate fine chemical, including the technical processes by which precipitated carbonate was made fit for a great range of user industries, cosmetics, tooth paste, cigarette paper and rubber and plastic compounds. Another mural panel filled in the details of chemical processing from kiln to silo, with additional pictures of one of the laboratories and the experimental workshop.

The treatment of the citric acid branch of the firm's activities was given realism by coloured photomicrographs of mould cultures, with the actual growing moulds shown through a binocular microscope. A fine set of enlarged photomicrographs depicted moulds in profile.

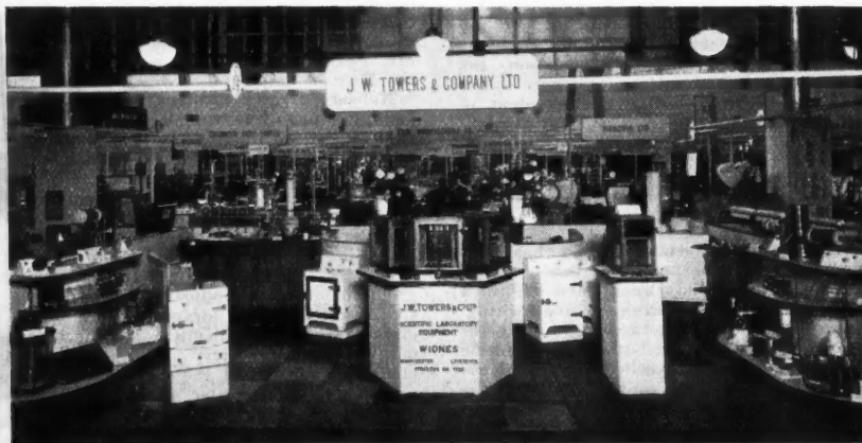
Among the many evidences in the London sections of the rewards of intensified research during 1947-1948 were a number of new products offered at Olympia by the Watford Chemical Co., Ltd.

Investigations carried out in conjunction with research workers in several countries have led to the production of a new series of water soluble and oil soluble oxidizers and fermentation inhibitors. Stabilin 1 and 2, preservatives of outstanding anti-bacterial properties were also shown. Other new



The spacious layout of the scientific instruments section resulted in greatly improved displays and permitted the effective staging of relatively large units of chemical apparatus, such as the fractionating column shown here on the Griffin & Tatlock stand

ranges available were connected with fine chemicals, the leather, paper, and paint industries, wetting agents and detergents.



J. W. Towers & Co., Ltd., was responsible for one of the more happily arranged arrays of laboratory equipment in the instrument section, in which analytical balances formed the centrepiece, flanked by the new automatic direct reading model of very advanced design

Personal News and Appointments

THE administration of the Sir George Beilby Memorial Fund, representing the Institute of Metals, the Royal Institute of Chemistry and the Society of Chemical Industry, has decided to make an award from the fund for 1948 of 150 guineas to DR. ARTHUR STUART CLARK LAWRENCE, in recognition of his research work in colloid science, with special reference to lubrication and fuel oils. After a distinguished early career at the Royal Institution, Dr. Lawrence published "Soap Films" (1929) and was awarded a DSIR senior research award to work in the department of physical chemistry, Cambridge, and later in Professor Rideal's newly formed laboratory of colloid science. He joined the Imperial College, London, in 1942 as head of the research team of the Joint Admiralty and Ministry of Supply advisory service on lubrication, and in 1947 he was appointed senior lecturer in chemistry at Sheffield University, which position he still holds.

MR. VICTOR D. WARREN, who was elected Lord Provost of Glasgow last week, is the assistant regional manager of Scotland and Northern Ireland for Imperial Chemical Industries, Ltd. He was formerly principal of Hunter & Warren, now incorporated in I.C.I., Ltd. At 45, Mr. Warren is one of the youngest men to occupy the high office in Glasgow, where he has represented the Park Ward since 1931. He became chairman of the Progressive party in 1946 and has been an active and energetic leader.

COL. A. JERRETT, president of the Traders' Road Transport Association, the national organisation for C licence-operators, has been elected a vice-president of the International Road Transport Union. The union has been granted official consultative status to the United Nations, and both Col. Jerrett and MR. F. D. FITZ-GERALD, national secretary of TRTA, have taken an active part in union affairs.

SIR EDWARD APPLETON, who has now taken up his duties as principal of Edinburgh University, last week gave the third of the Edinburgh Lectures on broadcasting. Sir Edward, who has done so much for the increase and distribution of scientific knowledge, gave an excellent survey of the development of radio and emphasised the technical efficiency of British broadcasting.

A new post of director of the Allied Association of Bleachers, Dyers, Printers and Finishers, representing all employers' organisations in the textile finishing trade, was filled on May 2, when MR. G. R. TAYLOR, a former official of the Lancashire

and Cheshire Coal Association, assumed the appointment.

EMERITUS PROFESSOR THOMAS STEWART PATTERSON, who died at his home at 89 Oakfield Avenue, Glasgow, on February 14, left £11,257. He occupied the Gardiner Chair of Organic Chemistry at Glasgow University from 1919 until his retirement in 1942.

SIR PETER RYLANDS, Bt., of Massey Hall, Thelwall, one of the founders, and twice president, of the FBI and High Sheriff of Cheshire, 1935, left £192,198, net £182,737. Sir Peter was for many years president of the Iron and Steel Wire Manufacturers' Association.

Obituary

MR. R. G. PERRY, of Barton House, Moreton-in-Marsh, died suddenly at his home on May 3 at the age of 76. By his death the chemical industry loses an outstanding personality who had made a great contribution to its development. In 1914, Mr. Perry, as chairman of Chance & Hunt, undertook the production of TNT for the Government at the Government factory at Oldbury. This vital task, about which complete data were not then available, called for the solution of many technical difficulties. The "Oldbury" process of manufacturing TNT was universally recognised and served once more when the second World War again necessitated intensive production. For these services Mr. Perry was appointed a Commander of the British Empire.

He served as a member of the Departmental Committee appointed after the 1914-18 war, to inquire into the position of the sulphuric acid and fertiliser industries. Mainly as a result of the recommendations of this committee the National Sulphuric Acid Association was constituted in 1919. Mr. Perry was chairman of this association from its inception until his resignation in 1941. He also took the lead among a small group of chemical industries whose initiative resulted in the formation of the Association of British Chemical Manufacturers, of which Mr. Perry was the second chairman and one of the only two life vice-presidents. He became a director of the National Smelting Co., Ltd., in 1930 and subsequently of the Imperial Smelting Corporation, Ltd.

MR. JOHN W. HAWLEY, B.Sc., who has died at Dumfries, was for many years analyst to the county of Dumfries, a position he assumed in 1926.

Technical Publications

POLYTHENE used in Tenaplas tubing and data about its mechanical and chemical properties are the subject of technical bulletin No. 1, produced by Tenaplas, Ltd. (Polythene Division), Upper Basildon, Berkshire. An illustrated pamphlet accompanying it shows that the tubing welds readily, is simple to install, and is jointed securely, and describes its many industrial applications.

* * *

An unbroken record of progress over 170 years is recorded in "At the Tail of Two Centuries" which describes the growth of Rose, Downs, and Thompson, Ltd., from the days when John Todd cast cannon at the Old Foundry, Hull, in 1777 to the large organisation of to-day, noted for its chemical and vegetable oil extraction plant. The booklet, which is handsomely produced and illustrated, shows again how much the growth of the chemical industry is indebted to private enterprise and initiative.

* * *

In connection with the engineering and hardware section of the British Industries Fair at Castle Bromwich, Birmingham, a specially illustrated booklet has been issued by the British Thomson-Houston Co., Ltd., Rugby. Besides surveying the firm's exhibits, the booklet reviews past achievements and present resources and is effectively illustrated.

* * *

A new pocket-sized booklet of 58 pp. containing a comprehensive record of the Mullard range of valves has been produced specially for service engineers. It is the first of its kind to be issued by Mullard Electronic Products, Ltd., since the end of the war.

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The properties and characteristics of 27 per cent chromium-iron are comprehensively presented in a 30-page American bulletin prepared by H. D. Newell, chief metallurgist of the Babcox & Wilcox Tube Company. It is illustrated with numerous photographs, tables, and graphs prepared by the company's research department. Among the subjects covered are properties at elevated temperatures, impact properties and notch sensitivity, structural characteristics, embrittlement phenomena, working and fabricating, and heat treating. The bulletin, TR-506 is being supplied without charge by the Babcock & Wilcox Tube company, Beaver Falls, Pennsylvania.



Extreme compactness of design is one of the outstanding merits of this new addition in the category of moisture meters of NPL standard. (The Baldwin Instrument Co., Ltd.)

An expert summary of the character and uses of silicone rubber has been contributed by Albright & Wilson, Ltd., to "Torque," the newly issued journal of Silentbloc, Ltd., and the Andre Rubber Co., Ltd., which summarises some of the more important applications of rubber in current designs in general and chemical engineering.

"The Blue Guides"

"The Blue Guides," English counterpart of the German Baedeker, will soon, it is hoped, be generally available again. Steps have been taken to secure the re-issue as quickly as possible of those volumes which during the war became out of print. Since the war four of the guides have been completely revised and reissued—"London" (The Short Guide), "Switzerland," "Scotland" and "Ireland." Thus the tradition established over 30 years ago by Findlay Muirhead and carried on by his son, L. Russell Muirhead, is being perpetuated, and with it the service to holiday makers and others, to whom improving currency and travel conditions render these guides indispensable once more. The publishers, Ernest Benn, Ltd., have now entered into an arrangement with the Rand McNally publishing house in Chicago to permit the guides to be issued in the U.S.A.

Home News Items

Shell in Glasgow.—Shell Chemicals, Ltd., have opened new divisional offices in Scotland at 28 St. Enoch Square, Glasgow (Telephone, Central 9561), where Scottish distribution will be handled.

Fish Poisoned.—Hundreds of dead trout have recently been seen floating in the River Alyn, according to Wrexham Angling Club. The pollution of the water is suspected, and samples have been taken for analysis.

Interior Decoration Exhibition.—Princess Elizabeth, patron of the British Colour Council, has suggested that the theme of the first exhibition of the newly formed Interior Decoration Design Centre should be "Colours and Designs of British China," with a special emphasis on Chelsea ware.

Ordnance Workers Killed.—An explosion, occurring while boxed ammunition was being loaded in railway trucks at the Royal Ordnance Factory, Swinnerton, Staffordshire, last week killed four of the process workers engaged in the work and injured another. All the men lived in Stoke-on-Trent.

Stainless Steel Vats.—The second of 11 large fermentors being constructed by a Fife chemical engineering firm has now been completed and shipped to Dublin. The vats, made of stainless steel, are thought to be the largest ever constructed by the flanged method. Each vat weighs 11 tons, is 15 ft in diameter.

Coal Production Down.—Output of deep-mined coal in the week ending May 7, was 44,700 tons less than in the comparable week of last year. This was due, the Ministry of Fuel states, to tonnage lost through disputes which was 75,100 tons more than in 1948. Larger losses were being reported as a result of strikes this week.

Cement Industry and Nationalisation.—Practically unanimous opposition to nationalisation of the cement industry has been shown by stockholders of the Associated Portland Cement Manufacturers, British Portland Cement Manufacturers, and Alpha Cement. Out of 22,400 replies to a circular letter, only 57 were in favour of nationalisation.

Pottery Manufacture in the Highlands.—Plans to utilise the electric power from the North of Scotland Hydro-Electric Power scheme for the development of pottery manufacture in small highland communities are now in hand. Mr. R. H. R. Robertson, chemical engineer of Glasgow, has been appointed as consultant on raw materials and will make a survey of clays, etc., suitable for exploitation.

Next Week's Events

MONDAY, MAY 16

Electrodepositors' Technical Society. London: Northampton Polytechnic, St. John Street, E.C.1, 6.0 p.m. Spring meeting. W. N. Bradshaw and S. G. Clarke: "Anodising-Investigations on the Anode Film and Its Formation."

TUESDAY, MAY 17

Institution of Chemical Engineers. London: Burlington House, Piccadilly, W.1, 5.30 p.m. A. C. Branch and J. L. Sweeten: "The Fabrication of Chemical Plant in Stainless Steel."

WEDNESDAY, MAY 18

Society of Chemical Industry. (Food Group-Nutrition Panel). London: School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6 p.m. Annual general meeting, 6.15 p.m. W. S. Butterworth; C. H. F. Fuller; D. M. Freeland and A. Bradley; Prof. J. Yudkin: "The Nation's Manufactured Foods," second meeting of the series.

Royal Institution. London. 21 Albemarle Street, W.1, 9.0 p.m. A. L. Hetherington: Chinese Ceramic Glazes, with a Special Reference to Copper Glazes."

THURSDAY, MAY 19

The Royal Society. London: Burlington House, W.1, 4.30 p.m. J. F. Nye: "Plastic Deformation of Silver Chloride I. Internal Stresses and the Glide Mechanism"; F. C. Frank and J. H. van der Merwe: "One Dimensional Dislocations I and II."

FRIDAY, MAY 20

Society of Glass Technology. St. Helens: Gas Showrooms, Radiant House, 7.15 p.m. Annual general meeting. F. J. Hurlbut: "The Measurement of Craftsmanship in Glass Working."

Institution of the Rubber Industry. (Midland Section.) Birmingham: Imperial Hotel, 4.15 p.m. Tea: 5 p.m. Fourth Foundation Lecture. Dr. G. Gee: "Polymer Science and Rubber Technology"; 7.0 p.m. Dinner.

Royal Statistical Society (Provisional South Wales Group). Crumlin, Monmouthshire: Technical College, 7.0 p.m. H. C. Tallis: "The Use of the Coefficient of Correlation in Assessing Data."

Hanover Export Trade Fair. Technical products and industrial equipments (until May 30).

Society of Dyers and Colourists. London: Waldorf Hotel, Aldwych, W.C.2, 7.15 p.m. Sixth Mercer Lecture. E. Wilson: "Some Applications of Chemistry to Textile Finishing."

American Chemical Notebook

(From Our New York Correspondent)

GOOD prospects for a greatly widened use of sodium fluosilicate, familiar in the past as a moth-proofing agent and in some laundry processes, are held out by Mr. C. A. Hampel, supervisor of inorganic technology in the Armcur Research Foundation. Reporting to the Chicago section of the American Chemical Society he has pointed out the marked repellent qualities of sodium fluosilicate towards many insects—ants, cockroaches, etc., and particularly towards rats. This cheap and abundant chemical, he has indicated, could be effectively used to treat pasteboard transport cartons and thus eliminate a large part of the enormous annual bill accountable to damage by rats. In the course of a year's study of sodium fluosilicate in which this conclusion was reached, it was noted that it also had valuable prospects as a preventive of dry rot in wood and other cellulose materials. The annual consumption of sodium fluosilicate, which contains the active element fluorine, amounts to only about 10,000 tons a year in the U.S.A., according to Mr. Hampel, who foresees that it would be easy to produce some 82,000 tons yearly.

* * *

Mr. Hugh S. Ferguson, executive vice president of the Dewey and Almy Chemical Company, Cambridge, Massachusetts, has announced that plans have been completed for the reopening of the company's Italian plant, in Naples. He indicated that the firm is considering the possibility of establishing a plant in France. The Naples plant, damaged during the war, is being rebuilt to resume production of container sealing compounds for the Italian food industry as well as products for improving the quality of concrete used in construction.

* * *

Expected to find wide use as a new insulating material, the world's lightest solid, a plastic foam made from a molasses-like synthetic resin which can be shipped in a barrel and foamed wherever needed has been developed by scientists of the Westinghouse Electric Corporation, Pittsburgh, Pa. Foamed into prefabricated metal wall sections, a 2 in. thick layer weighing only 300 lb. would be enough to insulate a complete six-room house and could be made from a 25-gallon barrel of the liquid phenolic resin. Resistant to fire, moisture, fungus growth and insects, the foam is said to be sufficiently inexpensive to be practical for many applications. Lighter than some

gases, the plastic foam is made by heating the resin at about 350°F. until it expands to 100 times its original volume. It then solidifies and thousands of gas bubbles entrapped in the foam give a reddish-brown sponge-like plastic.

* * *

The development of a new chemical wood preservative, copperised chromated zinc chloride, by a joint research programme of the Koppers Company, Inc., and E. I. Du Pont de Nemours & Co., Inc., was described at the last meeting of the American Wood Preservers' Association in St. Louis, Missouri. Describing characteristics of the new preservative, Mr. R. H. Bescher, technical director of Koppers wood preserving division, claimed that tests had revealed that copperised CzC possesses greater permanence of its toxic constituents than CzC and that the metal corrosion factor and the glow characteristics of the two preservatives are about the same. The new preservative, containing 73 per cent zinc chloride, 20 per cent sodium dichromate, and 7 per cent cupric chloride, has proved in pilot plant treatments to be similar in handling, treating, and control of the solution equilibrium to chromated zinc chloride and other salt preservatives containing more than one type of toxic ion.

* * *

A new plant for the production of smokeless solid fuel from bituminous coal, with an annual capacity of 250,000 to 300,000 tons, has been placed in operation at Pittsburgh, Pa., by the Disco Company, a subsidiary of the Pittsburgh Consolidation Coal Company. The product of the new plant, known as Disco, is for use in hand-fired furnaces, stoves, grates and fireplaces. The fuel is processed from specially prepared bituminous coal from which the tar has been removed by distillation.

* * *

Essential information from the point of view of safe processing and handling of β -naphthylamine is contained in the latest of the Chemical Data Safety Sheets (SD 32) presented by the Manufacturing Chemists' Association, Inc., the 32nd of the series of safety manuals. This covers the ground of physical and chemical properties of β -naphthylamine, recommends safe handling procedures and surveys health hazards and how they may be controlled.

German Chemical Totals

Several Reductions in February

REDUCTION of output of basic chemicals in the Western zones of Germany was fairly widespread in February. There were, however, several substantial increases, of which that of potash fertilisers from 50,900 metric tons (K_2O content) to the record total of 52,000 tons in February was the most conspicuous. Production of phosphatic fertilisers was maintained at 25,000 metric tons (P_2O_5 content).

Summarising the February totals, *The Report of the Control Commission for Germany* (April) notes that production of nitrogen fertilisers fell slightly in February to 19,300 metric tons of nitrogen. Primary nitrogen production which is restricted by the shortage of coke-oven gas, dropped to 15,000 metric tons (N content).

Power Shortage

Output of calcium carbide fell from 24,600 metric tons in January to 22,000 tons in February. The factory at Knapsack (Nordrhein-Westfalen) is producing at a record rate, but the plants in Bavaria are held back by the lack of hydro-electric power. Sulphuric acid is still a critical supply item, although imports are continuing to arrive fairly steadily. Output dropped from 70,900 metric tons (SO_3 content) in January to 64,400 tons in February.

The production of soda ash and caustic soda declined in February to 44,000 metric tons (Na_2CO_3 content) and 15,300 tons ($NaOH$ content) respectively. The chemical caustic soda plant at the factory at Koeln Kalk (Nordrhein-Westfalen) has begun production at a slowly increasing rate. This will aid in meeting the large demand for caustic soda, but at the same time will reduce the availability of soda ash, increased production of which depends on higher coal deliveries.

Tar Products and Dyestuffs

The production of the coal tar intermediate, Carbazole, which was resumed at Farbenfabriken Bayer, Leverkusen (Nordrhein-Westfalen), in August, 1948, for the first time since the end of the war, has shown a steady long-term increase from 2.3 metric tons in August to 5.2 tons in November, and to 12.6 tons in January, 1949.

The output of coal-tar dyes was unchanged in February at 1300 metric tons, which represents about 50 per cent of the present dyestuffs manufactured of the combined zones. The output of soap rose to 3400 metric tons in February in spite of the short month, but production of washing powders dropped to 17,300 metric tons.

Disposal of Cyanide Wastes

U.S. Method to Limit Pollution

A NEW and inexpensive process for the disposal of cyanide wastes from electroplating plants is reported from the U.S.A.

The method is easily adapted to industrial operations and is expected to go a long way in combating stream pollution. It requires only the use of a tank to hold the solution to be destroyed, equipped with a series of anodes, cathodes and heating coils attached to one end of the plating generators conveniently used in electro-plating operations.

The solution is electrolysed in the tank until tests indicate that all the cyanide is destroyed, and sulphuric acid is added to neutralise any sodium carbonate or cyanate which is formed.

The length of time required to destroy a cyanide plating solution, using the process, runs from 24 to 32 hours, permitting the operation to be carried on over week ends. A considerable amount of copper, moreover, is reclaimed for its salvage value.

The process has been developed by Mr. Maurice R. Caldwell, chief technician, and Mr. Lynuan B. Sperry, chief chemist, of the Doehler-Jarvis Corporation, Grand Rapids, Michigan, manufacturers of die-castings and related products. The firm is said to be destroying cyanide strike solutions at a cost of \$32 for 700 gallons.

The process is said to be better than other methods, such as acidification in a hermetically sealed chamber and the dissipation, by means of a high stack, of the resulting hydrocyanic acid gas, or alkaline chlorination, which also requires complex equipment and necessitates removal of sludge.

PROSPECTS IN PAKISTAN

DISAPPOINTMENT that the United Kingdom had not taken greater interest in the industrial development of Pakistan was expressed by the Prime Minister of Pakistan, Mr. Liaquat Ali Khan, before leaving London last week.

Pakistan, he pointed out, has good will towards Great Britain, and for her expansion programme needs jute, textile leather, chemical and paper-making works; she has important natural resources and conditions politically are favourable to the investment of foreign capital.

Such opportunities must be taken at once warned Mr. Liaquat Ali Khan, otherwise there was danger that Great Britain might lose the market to more energetic European competitors.

Overseas News Items

U.S. Zinc Price Reduced Again.—The fifth drop in the price of zinc since March 22 was announced last week with a reduction of one representative quotation to 12½ cents a pound.

Additional French Pyrites?—The discovery of good quality pyrites at Berchoux (Rhone) may lead to a re-opening of seams which were abandoned in 1932 following unfruitful research. It is thought, according to the geological situation, that seams may be similar to the excellent pyrites seams at Saint-Bel.

U.S. Coal Studies.—A new coal geology laboratory to facilitate studies of U.S. coal resources will be established by the U.S. Geological Survey at Ohio State University. An objective will be to conduct research on the fundamental nature of the fossil plants that compose coal, and to aid the delineation of coal deposits that are suited for special purposes, such as conversion to synthetic liquid fuels, or the manufacture of coke.

Tin Smelting in U.S.A.—Work is progressing on tin smelting plant, under construction at Sewaren, N.J., U.S.A., for the Vulcan Detinning Company, which will have a capacity of five tons of refined tin daily. The new smelter, the estimated cost of which is \$400,000, will utilise a newly-developed process for extraction of the metal from low-grade Bolivian concentrates, hitherto considered commercially impracticable.

American Enterprise in British Guiana.—The British Guiana Government has given John Younglove Cole, of New York, exclusive rights to search for radio-active ores in an area of two square miles in the Kanuku mountains. This follows the recent discovery by a hinterland rancher of the uranium-bearing mineral, euzenite, in the Rapununi district. Last month British Guiana was allotted £162,500 from a fund set up under the Colonial Development Act to complete geological mapping of the area and investigation of its mineral resources.

Chemical Controls in France.—Freeer conditions in the sale of chemical products have been introduced in France. Among products no longer controlled are: ammonium stearates and oleates and auxiliary products for the leather and textile industries containing fats. Glass cylinders are now sold freely, as are maize starch, glucose for industrial use, sulphonated derivatives, fatty spirits, and natural camphor. Products still subject to control include: castor oil, detergents, toilet soaps, potassium and soda bichromate and chromium sulphate.

Swiss Chemical Exports.—Official Swiss statistics show the value of chemicals, dyes and pharmaceuticals exported during March to amount to Fr. 38.7 million, as compared with Fr. 39.8 million in February. Industrial chemicals exports rose by Fr. 1 million to Fr. 6.1 million.

U.S. Metal Prices Reduced.—The price of lead was quoted last week by a leading custom smelter at New York at 14 c., a cut of 1 c. per lb. To meet the competitive price of the custom smelters Kennecott copper has reduced its price for copper by 5 c. to 18½ c. per lb.

Indian Oil Industry.—In order to encourage the development of oil production in villages, the Indian Oilseeds Committee at a meeting in New Delhi, recommended the establishment of a village oil seeds industry board and a training institute at Nagpur. The board will study the progress of schemes sanctioned for ghanai development. A request that the Central Government should prohibit the import of white mineral oil as it was being used for adulteration with mill and ghanai oils, was urged by the committee.

Butyl Rubber Ruling.—Increased use of natural rubber in the U.S.A. is foreshadowed by a new Commerce Department ruling which lays down that inner tube manufacturers are required to use only 60 per cent butyl rubber instead of 80 per cent as formerly. This ruling applies only to popular-size tubes with a cross section of 9.00 in. or less. This change could reduce the use of butyl from 60,000 to 40,000 tons annually, but it has such wide uses that it is not expected consumption will be materially decreased.

Drying Oils Research.—University officials and Montreal business men met recently at McGill University for the inauguration of the first programme in Canada of fundamental research in the chemistry of drying oils. This will be carried out by the department of chemistry under direction of Dr. R. V. V. Nicholls, associate professor, who presided over the inauguration in the Macdonald Chemistry Building. On view were two scientific instruments used in drying oil research: a \$1500 ultra-violet spectrophotometer and an infra-red spectrophotometer, rare in Canada, and costing nearly \$6000. With the use of these instruments researchers are enabled to examine transformations in oil over a period of time without the tedious task of isolating the substance examined. The research will be valuable particularly to the paint industry.

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

W. M. DELF (LIVERPOOL), LTD. (M., 14/5/49.) March 17, £3000 debenture, to W. M. Delf, Birkenhead; general charge.

WILLIAM PRICE (PLASTICS), LTD., Birmingham. (M., 14/5/49.) March 22, £2500 debenture, to B. B. Gardner, Marston Green; general charge. *Nil. April 24, 1948.

TEMPERATURE, LTD., London, S.W. (M., 14/5/49.) March 25, £4000 charge, to Radnor Estates, Ltd.; charged on land and buildings, known as Burlington Works and land with sheds and other buildings known as Mawbys Yard, Burlington Road, Fulham. *Nil. Jan. 5, 1948.

Satisfactions

KIRKBY PAINT MANUFACTURING CO., LTD., Wrexham. (M.S., 14/5/49.) Satisfaction, March 25, of mortgage registered Jan. 1, 1948.

MARSHALL CASTINGS, LTD., Birmingham. (M.S., 14/5/49.) Satisfaction, March 29, of debenture registered March 5, 1940.

Company News

Albright & Wilson, Ltd.—The directors have recommended payment of a final dividend of 15 per cent actual (9d. per 5s. unit), less tax, on the ordinary stock (making 25 per cent for the financial year ended December 31, 1948). The profit of the group, before taxation, for the year amounted to £1,012,083, of which £47,016 is attributable to the year 1947, and £84,061 to the outside shareholders of subsidiary companies, leaving a profit attributable to the shareholders of Albright & Wilson, Ltd., of £881,006, compared with a figure for 1947 of £817,058.

The Staveley Coal & Iron Co., Ltd., has acquired the whole of the shares in R. D. Nicol & Co., Ltd., manufacturers of oils and greases. Mr. D. M. Anderson will continue to act as managing director and Mr. M. Haigh as director and secretary.

The following increases in registered capital are announced: **Petroleum Development (Qatar), Ltd.**, from £8,490,100 to £9,990,100; **Basrah Petroleum Co., Ltd.**, from £8.6 million to £9.15 million; **Mosul Petroleum Co., Ltd.**, from £10.6 million to £10.9 million; **Syria Petroleum Co., Ltd.**, from £4,500,100 to £4,850,100; **Petroleum Development (Trucial Coast), Ltd.**, from £830,100 to £930,100; **Colin Stewart, Ltd.**, from £30,000 to £35,000; **Keystone Chemical Co., Ltd.**, from £100 to £10,000; **Novo, Ltd.**, from £2,100 to £12,000; **William Findlater & Co., Ltd.**, from £1000 to £2000.

New Companies Registered

Baldwin Chemical Sales, Ltd. (467,942). Private company. Capital £1000. Manufacturers of chemicals, etc. Directors: W. E. Baldwin, V. H. Forrester. Reg. office: London Road, Harlow, Essex.

Brummer, Ltd. (468,006). Private company. Capital £10,000. Manufacturers of wood cements and fillers, metal cements, paints, etc. Directors: R. F. Naudey and E. Naudey. Reg. office: 245 Oxford Street, W.L.

Kleenwell Manufacturing Company, Ltd. (467,845). Private company. Capital £1000. Objects: To acquire the business of manufacturers of antisepsics, insecticides, etc. Directors: J. Hatchman, C. Roberts, C. Chapman, R. Pollard. Reg. office: Wesley Street Works, Westhoughton, Lancs.

Meisl Evans Keith, Ltd. (467,918). Private company. Capital £10,000. Objects: To acquire the business of manufacturers of chemicals and raw materials carried on by Brit-Over, Ltd., J. Meisl and C. G. Meisl. Directors: E. O. Toft, J. Meisl, C. G. Meisl, D. Evans, C. C. Keith. Reg. office: 27 Chancery Lane, W.C.2.

J. H. Pepper, Ltd. (467,839). Private company. Capital £500. Manufacturing chemists, etc. Directors: J. F. L. Ivey, A. J. S. Ivey, F. R. Pidden. Reg. office: 34 Harold Road, Upper Norwood, S.E.19.

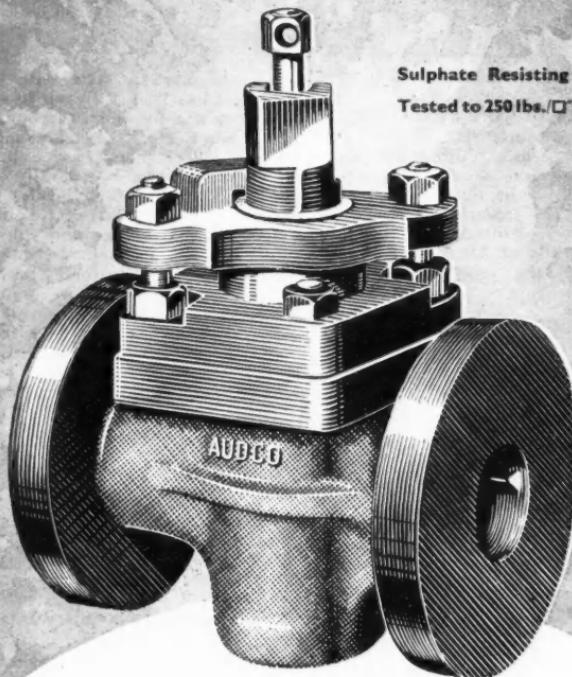
Chemical and Allied Stocks and Shares

STOCK markets have been unresponsive to the Berlin news, and with business in most sections failing to expand, price movements were generally small. British Funds receded, taking their cue from the new 3 per cent British Gas stock, which, after establishing a premium of 25s. over the issue price of £100, came back to £100 9/16. Industrial shares derived moderate encouragement from the good





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impression created by the important financial results that have come to hand, but movements generally were small and indefinite.

Imperial Chemical have been steady at 46s. 9d. xd on the annual report which emphasises the group's achievements, big capital commitments and the further expansion in export markets. The prevailing view is that there are good prospects of the 10 per cent dividend being maintained in future, particularly as it seems likely that this year earnings should benefit much more fully from the additional capital raised last year.

Elsewhere, Monsanto Chemical held steady at 57s. 6d., Fisons were 48s. 9d., Burt Boulton 27s. 6d., while William Blythe 3s. shares have been firm at 22s. on the financial results, and Brotherton 10s. shares were close on 21s. Bowamans Chemicals 4s. shares were 7s., and Albright & Wilson 5s. ordinary were steady at 30s. 6d. reflecting satisfaction with the profits and the 25 per cent dividend. Turner & Newall at 79s. 3d. failed to hold all an earlier gain, and United Molasses at 46s. 3d. became easier, awaiting the full report and accounts. Units of the Distillers Co. have been more active around 27s. 6d., but failed to hold their recent rise.

Shares of soap and allied companies improved, on the view that recent relaxation of controls may be followed by the end of soap rationing later in the year. Levers were up to 47s. 9d. Elsewhere, British Aluminium have been steadier at 47s. 6d., with British Oxygen at £5 and Amalgamated Metal 20s. 6d.

Iron and steel shares have been more prominent under the lead of Sheepbridge which advanced afresh to 75s on full details of the company's engineering subsidiary. Staveley were good at 90s. 6d. on the possibility that the company may follow a similar course by forming those of its assets repossessed from nationalisation into a separate subsidiary. Guest Keen were good at 50s. 6d., and British Benzol & Coal Distillation shares were up to 92s. 6d. on talk of a higher dividend. Babcock & Wilcox at 72s. were better again on the strong position disclosed by the report and accounts.

Shares of companies connected with plastics remained uncertain, and following the lower interim dividend Kleemann receded to 14s. British Xylonite were 80s., De La Rue 36s., and British Industrial Plastics eased to 5s. 4½d. In other directions, Dunlop Rubber changed hands around 68s. 6d. in front of the financial results.

Boots Drug have been firm at 54s. 6d., British Drug 5s. units were better at

7s. 6d., Sangers 31s. 10½d., and British Match steady at 35s. 6d., with Borax Consolidated 53s. 6d. Oils have been steadier, Anglo-Iranian at £8 3/16, Shell 65s. 7½d., and Burmah Oil 63s. 9d. Wakefield were 75s. awaiting the financial results.

British Chemical Prices

Market Reports

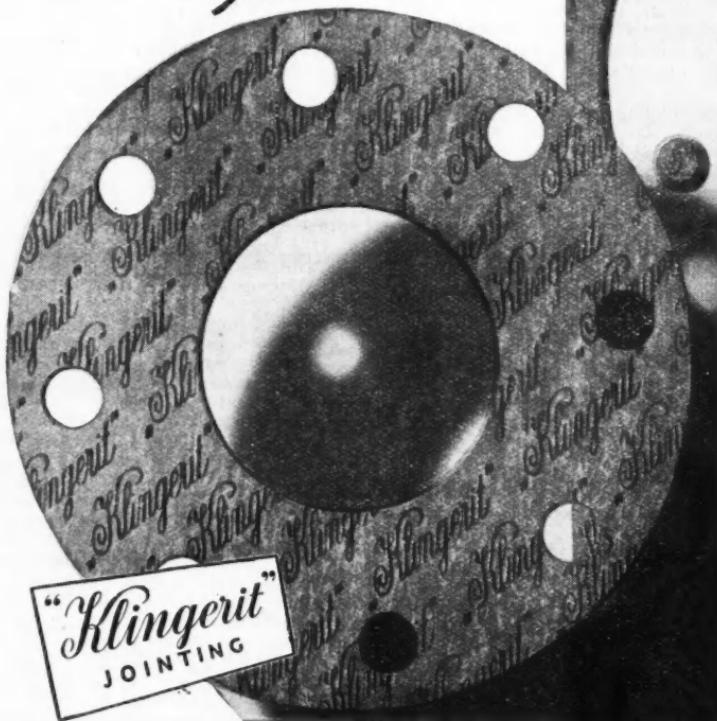
A STEADY movement is reported from practically all sections of the industrial chemicals market. The call for contract deliveries has been fully up to schedule and new bookings for home account have been on a fair scale. A satisfactory export demand for chemicals has also been maintained and values generally show little alteration from recent levels. Among the soda compounds an active demand continues for bicarbonate and chlorate of soda while the potash chemicals generally remain in strong request. Items for which there has been a fairly brisk inquiry include bleaching powder, hydrogen peroxide and formaldehyde. There is a good call for white and red lead. Ground white lead has been reduced by £2 per ton owing to the decrease in the controlled price of linseed oil. The coal tar products market is without feature, and while there has been a steady inquiry for most products available supplies are adequate to take care of a moderate home demand.

MANCHESTER.—Prices maintain a steady front in most sections of the Manchester chemical market and little in the way of actual change has occurred during the past week. Caustic soda, soda ash and other leading alkalis are meeting with a good demand from home users as well as for shipment, and plenty of buying interest has also been reported in respect of most other heavy chemicals. Satisfactory conditions are reported regarding actual deliveries into consumption. In some sections of the fertiliser trade the demand is quieter, but in the compounds good quantities are still being called for. Trade in the tar products is patchy, but a steady outlet is being found for the light distillates.

GLASGOW.—The recent tendency for prices to be lowered has continued during the past week in the Scottish chemical market. The demand for phosphoric acid has shown an increase as a result of a number of light engineering firms using this material in rust-prevention processes. Apart from this demand, deliveries have been normal. The export market has again been a little more active, although the volume of orders being booked is slightly lower than earlier in the year.

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Patent Processes in Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patent Office, Southampton Buildings, London, W.C.2. at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Water-soluble phthalocyanine derivatives.—Imperial Chemical Industries, Ltd., N. H. Haddock, and C. Wood. Nov. 22, 1946. Addition to 587,636.) 619,035.

Dyestuffs of the anthraquinone series.—Imperial Chemical Industries, Ltd., F. H. Slinger, and W. W. Tatum. Nov. 22, 1946. 619,034.

Method of and furnace for annealing metal strips.—Cold Metal Products Co. Aug. 5, 1943. 619,176.

Diacetylenic diamines.—Imperial Chemical Industries, Ltd., J. D. Rose, and B.C.L. Weedon. Nov. 27, 1946. 619,206.

Apparatus for studying fluid-flow.—F. R. Murray. Nov. 27, 1946. 619,250.

Apparatus for the automatic indication and regulation of the viscosity or concentration in liquids.—K. T. Kalle. Nov. 30, 1945. 619,253.

Automatic dipping plants.—Electro-Chemical Engineering Co., Ltd. (A. Smart). Nov. 29, 1946. 619,263.

Manufacture of polymeric ureas.—Imperial Chemical Industries, Ltd., G. D. Buckley, and N. H. Ray. Nov. 29, 1946. 619,275.

Soldering aluminium and alloys thereof.—General Electric Co., Ltd., and J. F. Smith. Nov. 29, 1946. 619,279.

Uniting of metals.—General Electric Co., Ltd., and J. F. Smith. Nov. 29, 1946. 619,280.

Production of colloidal silver.—Ilford, Ltd., and H. O. Dickenson. Nov. 29, 1946. 619,283.

Manufacture of injection-moulded reinforced articles made of plastic material.—E. A. Chapuis. May, 14, 1940. 619,295.

Process and apparatus for blending comminuted solid material with other solid materials.—J. M. Lloyd, and D. L. Lloyd. Nov. 30, 1946. 619,296.

Manufacture of nitrogen-containing linear polymers.—H. Dreyfus. Jan. 23, 1939. 620,116.

Process for the simultaneous manufacture of iron and alumina, and of hydraulic cement and other valuable products.—J. C. Seailles. Feb. 6, 1939. 619,937.

Stabilisation of halogenated ethylenes containing fluorine.—E. I. Du Pont de Nemours & Co. Feb. 15, 1943. 619,758.

Method of and apparatus for heat treatment of metal articles.—Budd Induction Heating, Inc. Feb. 24, 1943. 620,117.

Methods for dry distillation.—E. A. Johansson. Jan. 16, 1945. 620,029.

Manufacture of 2,4-dinitro-6-cyclohexylphenyl.—Pest Control, Ltd., M. Hawker, J. W. Warburg, and C. H. Barker. Sept. 5, 1944. 620,026.

Radiant thermal energy detectors.—British Thomson-Houston Co., Ltd. Sept. 30, 1943. 619,942.

Casting of metals.—Bristol Aeroplane Co., Ltd. Feb. 28, 1945. 620,120.

Preparation of guanidine salts.—Henley Advisory Council for Scientific & Industrial Research. Oct. 25, 1944. 620,030.

Production of sisal fibre.—M. E. R. Rutherford. [Legal representative of E. D. Rutherford (deceased)]. Aug. 21, 1946. 619,853.

Liquid level indicators for use with receptacles for liquified gases.—Air Liquide, Soc. Anon. Pour l'Etude et l'Exploitation des Procedes G. Claude. Aug. 10, 1943. 619,949.

Apparatus for carrying out gaseous reactions at high temperatures.—C. Arnold. (Standard Oil Development Co.) Sept. 27, 1945. 619,761.

Corrosion preventing means for ferrous metal water tanks.—W. W. Triggs. (McGraw Electric Co.). Oct. 1, 1945. 619,950.

Gill drawing, roving, and like frames for use in the preparation of textile fibres.—J. Wilson, and H. Oliver. Oct. 3, 1945. 619,854.

Method for dehydrating and purifying, in a continuous operation, raw phenols extracted from coal tar.—Soc. pour l'Exploitation des Procedes Ab-der-Haldeu. April 24, 1942. 619,856.

Preparation of resinous copolymerisation products.—Bakelite, Ltd. Oct. 27, 1944. 620,034.

Method of and apparatus for controlling continuous vacuum rectification of coal tar phenols and other mixtures of homologous compounds.—Soc. pour l'Exploitation des procedes Ab-der-Halden. April 24, 1942. 619,857.

Optical projectors.—British Solenoids, Ltd., and A. F. Wood. Nov. 6, 1945. 619,951.

Laminated resin-bonded fibrous sheet material.—A. P. Thurston. (Owens-Corning Fiberglas Corporation.) July 25, 1945. 619,674.

Distillation of coal tar or mineral oils.—Newton-Chambers & Co., Ltd., and H. C. Mann. Sept. 10, 1945. 619,496.

Manufacture of biguanide derivatives.—I.C.I., Ltd., F. H. S. Curd, D. N. Richardson, and F. L. Rose. Dec. 8, 1945. 619,498.

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Methods and apparatus for shaping sheet thermo-plastic material centrifugally.—Goodyear Aircraft Corporation. March 29, 1945. 619,675.

Manufacture of alkyl-halogenophenyl-dicyandiamides.—I.C.I., Ltd., F. H. S. Curd, E. C. Owen, and D. N. Richardson. Dec. 8, 1945. 619,497.

Resin compositions.—W. N. Haworth, and L. F. Wiggins. Oct. 17, 1945. 619,500.

Production of textile fibres.—C. A. Waller. Oct. 22, 1945. 619,502.

Process of manufacturing benzene hexachloride of very low melting point and products obtained by such process.—Solvay & Cie. Sept. 24, 1945. 619,677.

Process for the manufacture of aqueous dispersions of polymers of substances capable of polymerisation.—N. V. de Bataafsche Petroleum Maatschappij. Oct. 24, 1945. 619,513.

Organic mercury compounds and processes for preparing same.—R. A. Lerman. Feb. 16, 1945. 619,515.

Insecticides and their methods of application.—Electrolux, Ltd. June 7, 1945. 619,687.

Manufacture of trisazo-dyestuffs.—Ciba, Ltd. June 21, 1945. 619,688.

Refining copper.—Revere Copper & Brass, Inc. Feb. 19, 1946. 619,527.

Composite sheet material.—W. Zagrodzki, K. W. Mieszkis, and W. Z. Poklewski-Kozieill. July 4, 1946. 619,531.

Sulphanilamido thiazoles.—Sir W. N. Haworth, and L. F. Wiggins. July 11, 1946. 619,693.

Manufacture and application of textile treatment agents.—I.C.I., Ltd., W. Baird, T. Barr, A. Lowe, and J. Oliver. Aug. 14, 1946. 619,536.

Ceramic dielectric compositions.—Titanium Alloy Manufacturing Co. Nov. 12, 1942. 619,538.

Condensation pump for producing high vacuum.—Distillation Products, Inc. Dec. 15, 1945. 619,555.

Casting steel in ingot moulds.—P. C. M. Rebut. April 23, 1941. 619,543.

Tubes for effecting the exchange of heat between fluids.—Heat Exchangers, Ltd., and D. W. Rudorff. Dec. 2, 1946. 619,307.

Gauges for measuring liquid levels.—Yarnall-Waring Co. March 6, 1946. 619,704.

Electro-brightening treatment of metals.—High Duty Alloys, Ltd., and L. Whitby. Dec. 3, 1946. 619,336.

Method of fusing iron and iron alloys with carbon, and bodies produced according to this method.—Brown, Boveri & Cie A.G. Dec. 4, 1945. 619,241.

Anion exchange resins.—I.C.I., Ltd., J. R. Myles, and W. J. Levy. Dec. 4, 1946. 619,356.

Thioindigo dyestuff.—I.C.I., Ltd., and D. G. Wilkinson. Dec. 4, 1946. 619,357.

Manufacture of azo-dyestuffs.—Ciba, Ltd. Dec. 14, 1945. 619,373.

Coolers for liquids.—O. Legg. Dec. 5, 1946. 619,381.

Manufacture of lenses from transparent polymerisable organic plastics.—Combined Optical Industries, Ltd., and J. Johnson. Dec. 5, 1946. 619,384.

Continuous processes for the production and treatment of artificial threads.—Lustrafil, Ltd., and S. W. Barker. Dec. 6, 1946. 619,393.

Production of vinyl fluoride.—I.C.I., Ltd. Dec. 6, 1945. 619,394.

Preparation of difluoroethane.—E. I. Du Pont de Nemours & Co. Dec. 7, 1945. 619,395.

Methods of manufacturing strip-like glass.—N.V. Philips' Gloeilampenfabrieken. July 6, 1943. 619,400.

Preparation of glycerol ethers.—British Drug Houses, Ltd., W. Bradley, and O. Stephenson. Dec. 6, 1946. 619,403.

Methods of humidifying dextrine.—S. Neumann. Dec. 6, 1946. 619,404.

Manufacture of cellulose acetate filaments, films or the like.—T. F. Barrington. Dec. 7, 1946. 619,564.

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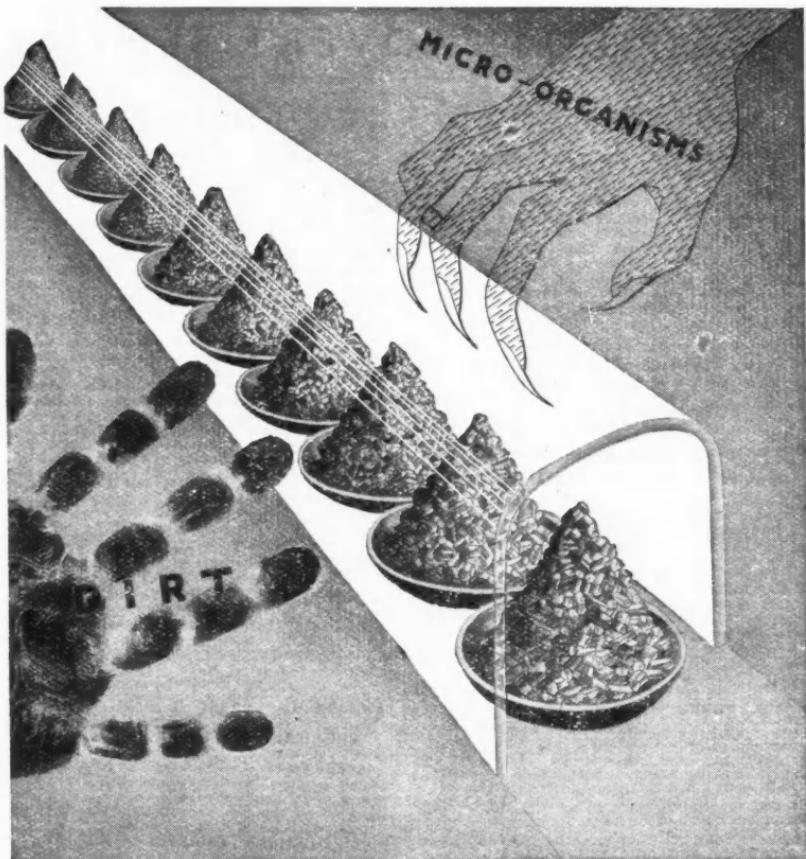
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Applications should be made by letter, addressed to **The Personnel Superintendent, Radiant House, 18 26, Bold Street, Liverpool, 1**, and should be received by him not later than 28th May. Copy, not original references should be enclosed.

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Candidates in both the above categories should be between 27 and 35 years of age; the work will be concerned with the operation and development side of oil refinery equipment, but specialised oil experience is not essential. A knowledge and appreciation of the fundamentals of approach to scientific and technical problems associated with large scale operations is, however, essential. Applicants must also possess the necessary personality, initiative and drive, to direct the work of others, and to carry out independent investigations requiring tact and organising ability. Prospects include interesting work, scope for initiative, and good opportunities for advancement.

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Applications giving full details of education, qualifications and experience to Box No. 2804, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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Candidates must be at least 17½ years and under 26 years of age on 1st August, 1949; time spent on a regular engagement in H.M. Forces may be deducted from actual age. Candidates must have obtained the Higher School Certificate with mathematics or a science subject as a principal subject, or an equivalent qualification. Higher qualifications will be regarded as an advantage to candidates over the age of 20.

The inclusive London salary scale (men) is £230-£490 rates for women are somewhat lower. Superannuation provision is made under the Superannuation Acts.

Further particulars and forms of application from the Secretary, Civil Service Commission, Scientific Branch, 27, Grosvenor Square, London, W.1, quoting No. 2522. Completed application forms should be returned as soon as possible. 233/300.

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